

## **APPENDIX B**

### **NORTHWEST RESEARCH OBSIDIAN STUDIES LABORATORY REPORT OF X-RAY FLUORESCENCE ANALYSIS AND OBSIDIAN HYDRATION MEASUREMENT**

## **X-Ray Fluorescence Analysis and Obsidian Hydration Measurement of Artifact Obsidian from Sites 35-DS-173, 35-DS-1076, 35-DS-1599, RC-1, RC-4, and Three Isolates, Redmond Caves Vicinity, Deschutes County, Oregon**

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(b) (3) Cultural Resources (ARPA) obsidian from (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) Deschutes County, Oregon were submitted for energy dispersive X-ray fluorescence trace element provenience analysis. (b) (3) Cultural Resources (ARPA) of the (b) (3) Cultural Resources (ARPA) specimens from (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were also processed for hydration rim measurements. The samples were prepared and analyzed at the Northwest Research Obsidian Studies Laboratory under the accession numbers 2003-06 and 2003-53.

### **Analytical Methods**

**X-Ray Fluorescence Analysis.** Nondestructive trace element analysis of the samples was completed using a Spectrace 5000 energy dispersive X-ray fluorescence spectrometer. The system is equipped with a Si(Li) detector with a resolution of 155 eV FWHM for 5.9 keV X-rays (at 1000 counts per second) in an area 30 mm<sup>2</sup>. Signals from the spectrometer are amplified and filtered by a time variant pulse processor and sent to a 100 MHZ Wilkinson type analog-to-digital converter. The X-ray tube employed is a Bremssstrahlung type, with a rhodium target, and 5 mil Be window. The tube is driven by a 50 kV 1 mA high voltage power supply, providing a voltage range of 4 to 50 kV. For the elements Zn, Ga, Rb, Sr, Y, Zr, Nb, Th, and Pb that are reported in Table A-1, we analyzed the collection with a collimator installed and used a 45KV tube voltage setting and 0.60 mA tube current setting.

The diagnostic trace element values used to characterize the samples are compared directly to those for known obsidian sources reported in the literature and with unpublished trace element data collected through analysis of geologic source samples (Northwest Research 2003). (b) (3) Cultural Resources (ARPA) are correlated to a parent obsidian source (or geochemical source group) if diagnostic trace element values fall within about two standard deviations of the analytical uncertainty of the known upper and lower limits of chemical variability recorded for the source. Occasionally, visual attributes are used to corroborate the source assignments although sources are never assigned solely on the basis of megascopic characteristics.

**Obsidian Hydration Analysis.** An appropriate section of each (b) (3) Cultural Resources (ARPA) is selected for hydration slide preparation. Two parallel cuts are made into the edge of the artifact using a lapidary saw equipped with 4-inch diameter diamond-impregnated .004" thick blades. The resultant cross-section of the (b) (3) Cultural Resources (ARPA) (approximately one millimeter thick) is removed and mounted on a petrographic microscope slide with Lakeside thermoplastic cement and is then ground to a final thickness of 30-50 microns.

The prepared slide is measured using an Olympus BHT petrographic microscope fitted with a filar screw micrometer eyepiece. When a clearly defined hydration layer is identified, the section is centered in the field of view to minimize parallax effects. Four rim measurements are typically recorded for each artifact or examined surface. Hydration rinds smaller than one micron often cannot be resolved by optical microscopy. Hydration thicknesses are reported to the nearest 0.1  $\mu$ m and represent the mean value for all readings. Standard deviation values for each measured surface indicate the variability for hydration thickness measurements recorded for each specimen. It is important to note that these values reflect only the reading uncertainty of the rim values and do not take into account the resolution limitations of the microscope or other sources of uncertainty that enter into the formation of hydration rims.

## Northwest Research Obsidian Studies Laboratory Report 2003-53

Additional details about specific analytical methods and procedures used for the analysis of the elements reported in Table A-1 and the preparation and measurement of hydration rims are available at the Northwest Research Obsidian Studies Laboratory World Wide Web site at [www.obsidianlab.com](http://www.obsidianlab.com).

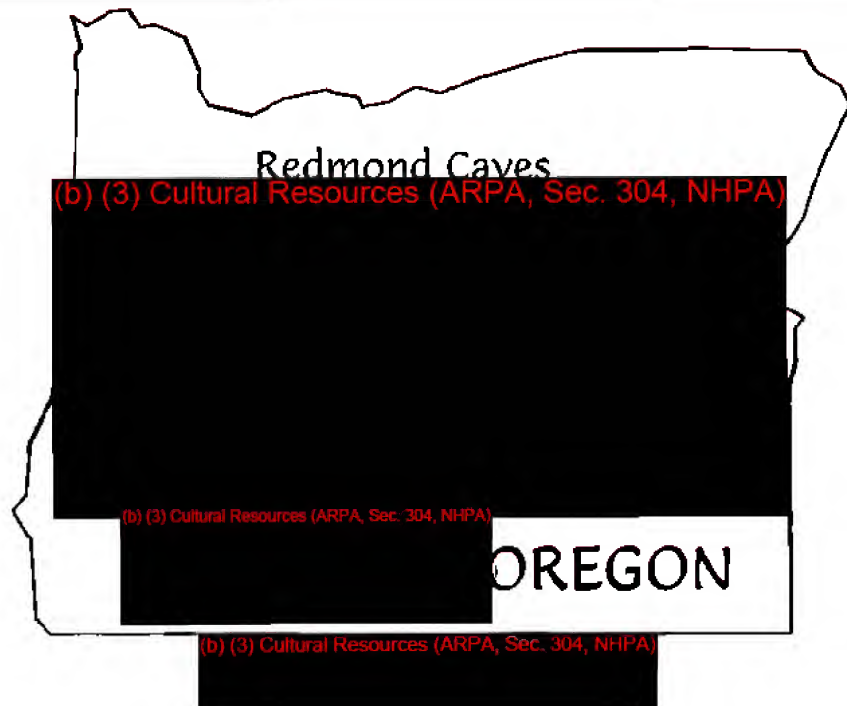
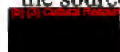
### Results of Analysis

**X-Ray Fluorescence Analysis.** Six geochemical obsidian sources or source groups, five of which were correlated with known geologic sources, were identified among the [REDACTED] obsidian [REDACTED] that were characterized by X-ray fluorescence analysis. The locations of the sites and the obsidian sources are shown in Figure 1. Analytical results are presented in Table A-1 in the Appendix and are summarized in Table 1 and Figure 2. Descriptive information about the identified obsidian sources is outlined in Table 2.

Table 1. Summary of results of trace element studies of artifacts.

Geologic Source	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	Total
(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)		
Total	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	

Figure 1. Locations of the sites and the sources of the characterized



Northwest Research Obsidian Studies Laboratory Report 2003-53

Table 2. Description of obsidian sources identified in the current investigation. Summaries include results of unpublished field and geochemical source research conducted by Northwest Research. Table is continued on the following page.

Geologic Source	Location	Description	References
(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)			Connolly 1999 MacLeod et al. 1995 Musil and O'Neill 1997 Skinner 1983, 1995a Skinner and Winkler 1991, 1994
			Carlson 1994 Connolly 1999 Flerniken and Ozburn 1988 Friedman 1977 Friedman and Obradovich 1981 Hughes 1992 Linneman 1990 MacLeod et al. 1995 Musil and O'Neill 1997 Skinner 1983, 1995a, 1995b Skinner and Winkler 1991, 1994 Williams 1935
			Anttonen 1972 Carlson 1994 Hill 1992 Hughes 1992, 1993 Hughes, S. 1983 Musil and O'Neill 1997 Skinner 1983, 1986, 1995a, 1995b Skinner and Winkler 1991, 1994 South 1999 Taylor 1968 Taylor et al. 1987 White 1974, 1975 Williams 1944



Northwest Research Obsidian Studies Laboratory Report 2003-53

Table 2 (continued). Description of obsidian sources identified in the current investigation.

Geologic Source	Location	Description	References
(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)			Ambroz 1997 Armitage 1995 Endzweig 1994 Hatch 1998 Hughes 1986 Musil and O'Neill 1997 Skinner 1983, 1995a, 1995b Skinner and Winkler 1991, 1994
			Hughes 1986 Hughes and Mikkelsen 1985 Lalande 1990 Musil and O'Neill 1997 Skinner 1995a Skinner and Winkler 1991, 1994
			Connolly 1999 Skinner 1995a, 1995b

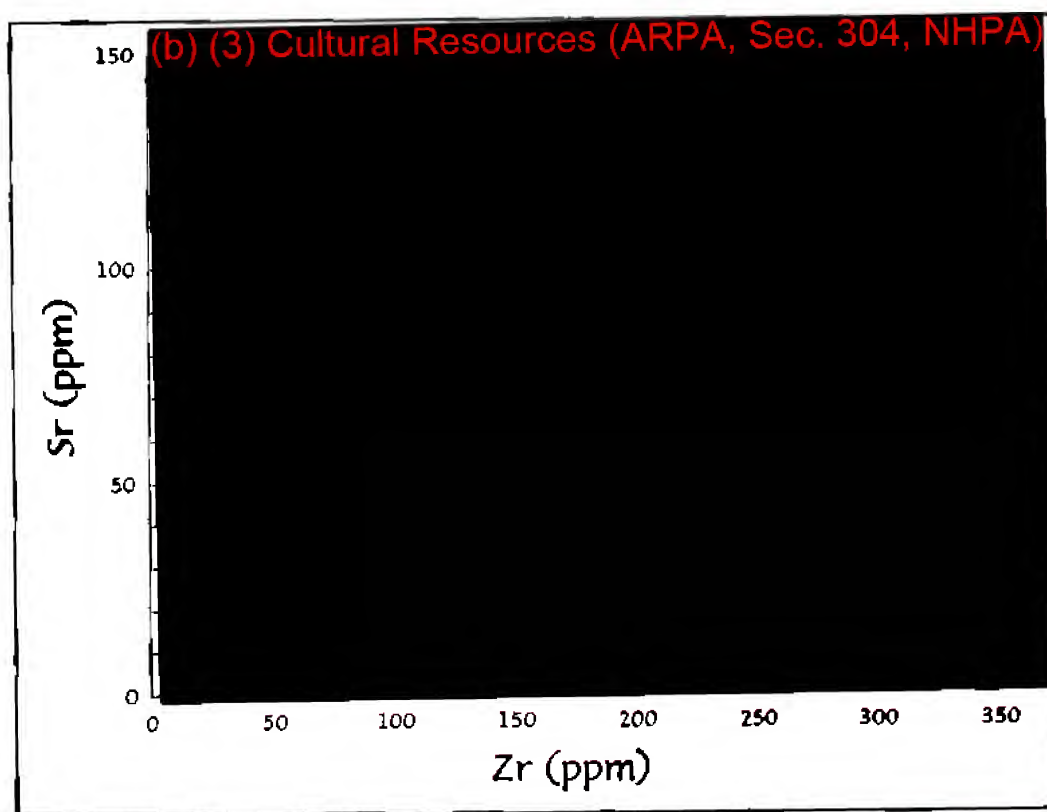


Figure 2. Scatterplot of strontium (Sr) plotted versus zirconium (Zr) for all analyzed

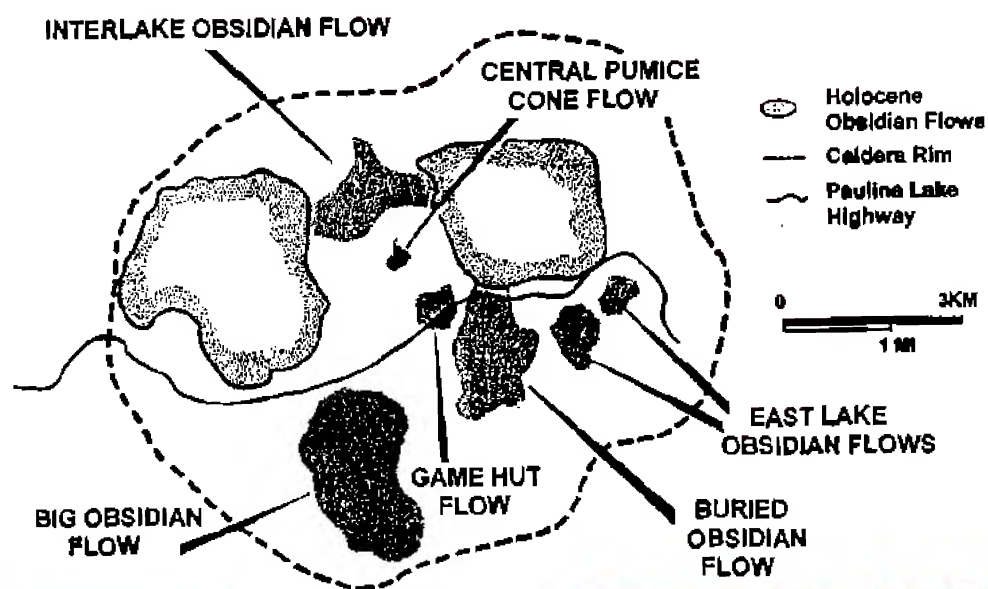


Figure 3. Obsidian flows located within the caldera of Oregon (adapted from Skinner 1995a).

# Northwest Research Obsidian Studies Laboratory Report 2003-53

Obsidian Hydration Analysis. The (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) from (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) that were characterized by X-ray fluorescence trace element analysis were also prepared for obsidian hydration analysis but yielded only (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) measurable rims. Although we were able to successfully measure only (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) hydration rims on the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) from (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) that were correlated with the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) source, this was not unexpected. The success rate with (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) from this source has always been rather poor in the past projects. The (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) is generally opaque and somewhat crystalline and visible hydration rims are often not present or are unreadable.

The specimen slides are curated at the Northwest Research Obsidian Studies Laboratory under accession numbers 2003-06 and 2003-53. The results are reported in Table B-1 in the Appendix and are summarized in Table 3. Available hydration rate information is presented in Table 4.

Table 3. Summary of results of obsidian hydration analysis of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) from sites (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). Hydration rim widths are reported in microns.

Geologic Source	Archaeological Sites (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	Total
(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
Total	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Table 4. Hydration rate information reported in the literature for obsidian sources identified in the current investigation. Table is continued on following page.

Geologic Source	Rate	Comments	References
(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	<p><sup>A</sup> Skinner 1995b</p> <p><sup>B</sup> Friedman 1977</p> <p><sup>C</sup> Friedman and Obradovich 1981</p> <p><sup>D</sup> Connolly and Byram 1999</p> <p><sup>E</sup> Skinner 1995b</p>

## Northwest Research Obsidian Studies Laboratory Report 2003-53

Table 4 (continued). Hydration rate information reported in the literature for obsidian sources identified in the current investigation.

Geologic Source	Rate	Comments	References
<b>(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)</b>			<sup>F</sup> Skinner 1995b
			<sup>G</sup> Bergland et al. 1994 <sup>H</sup> Pettigrew 1996, 1998 <sup>H</sup> Skinner 1995b <sup>I</sup> Wilson 1995

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# Northwest Research Obsidian Studies Laboratory

Table A-1. Results of XRF Studies: Redmond Caves Vicinity Sites, Deschutes County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe <sub>2</sub> O <sub>3</sub> <sup>F</sup>	Fe:Mn	Fe:Ti	
(b) (3) Cultural Resources (AR)	1	1-11932A	53 ± 8	24 4	149 4	65 9	43 3	290 7	17 1	NM NM	NM NM	NM NM	NM NM	56.7	45.9	(b) (3) Cultural Resources (AR) Source (ARPA, Sec. 304, NHPA)
	2	1-11932B	48 + 7	23 4	131 4	63 9	43 3	284 7	19 1	1450 77	339 46	NM NM	1.78 0.11	50.6	38.8	
	3	1-11932C	49 ± 8	12 5	121 4	58 9	39 3	266 7	17 1	NM NM	NM NM	NM NM	NM NM	51.2	48.9	
	4	1-11918D	49 ± 7	15 4	135 4	61 9	40 3	277 7	15 1	1295 77	410 46	NM NM	1.86 0.11	42.9	45.4	
	5	1-11932E	51 ± 7	19 4	130 4	66 9	42 3	275 7	15 1	1411 77	330 46	NM NM	1.93 0.11	56.4	43.1	
	6	1-11922F	67 ± 7	25 4	138 4	66 9	44 3	188 7	8 1	603 76	298 46	NM NM	1.59 0.11	52.5	83.7	
	7	1-11939G	61 ± 7	17 4	141 4	62 9	41 3	285 7	16 1	1283 77	414 46	NM NM	1.88 0.11	42.8	46.3	
	8	1-11939H	40 ± 7	22 4	142 4	61 9	41 3	282 7	18 1	1215 77	343 46	NM NM	1.59 0.11	45.2	41.7	
	9	1-11925I	53 ± 7	15 4	123 4	79 9	40 3	253 7	11 1	1249 77	310 46	984 NM	1.81 0.11	57.0	45.9	
	10	1-11932J	33 ± 7	14 4	77 4	103 9	17 3	94 7	8 1	410 75	209 46	NM NM	0.68 0.11	36.4	56.5	
	11	1-11925K	55 ± 7	22 4	129 4	78 9	39 3	258 7	12 1	1168 77	294 46	948 NM	1.55 0.11	52.2	42.3	
	12	1-11939L	48 ± 7	15 4	135 4	61 9	41 3	282 7	16 1	1273 77	375 46	NM NM	1.91 0.11	48.5	47.3	
	13	1-11918M	45 ± 7	16 4	141 4	61 9	40 3	280 7	17 1	1205 77	322 46	NM NM	1.77 0.11	53.5	46.6	
	14	1-11939N	55 ± 7	19 4	146 4	63 9	40 3	286 7	17 1	1362 77	370 46	NM NM	2.01 0.11	51.7	46.5	
	15	1-11939O	33 + 7	11 4	80 4	110 9	16 3	98 7	6 1	536 76	300 46	NM NM	0.89 0.11	30.5	55.1	

All trace element values reported in parts per million; ± = analytical uncertainty estimate (in ppm). Iron content reported as weight percent oxide.  
 NA = Not available; ND = Not detected; NM = Not measured.; \* - Small sample.

# Northwest Research Obsidian Studies Laboratory

Table A-1. Results of XRF Studies: Redmond Caves Vicinity Sites, Deschutes County, Oregon

Site	Specimen No.	Catalog No.	Trace Element Concentrations											Ratios		Source
			Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe <sub>2</sub> O <sub>3</sub> <sup>T</sup>	Fe:Mn	Fe:Ti	
16	1-11938P		56	20	139	59	44	285	16	1206	364	NM	1.81	47.5	47.3	16
			± 7	4	4	9	3	7	1	77	46	NM	0.11			
	17	1-11923Q	47	19	128	79	40	261	12	1152	325	963	1.75	52.2	48.0	
			± 7	4	4	9	3	7	1	77	46	NM	0.11			
	18	1-11924R	51	15	137	58	43	288	19	1288	473	NM	1.90	37.3	46.4	
			± 7	4	4	9	3	7	1	77	46	NM	0.11			
	19	1495-RC1-S-1	64	19	135	65	40	281	18	NM	NM	NM	NM	61.2	38.9	
			± 7	4	4	9	3	7	1	NM	NM	NM	NM			
	20	1495-RC7-S-1	59	21	137	66	40	189	9	1204	323	NM	1.68	50.6	44.3	
			± 7	4	4	9	3	7	1	77	46	NM	0.11			
	21	1495-RC-ISO3	37	17	126	78	41	257	12	1374	321	951	1.86	56.4	42.8	
			± 7	4	4	9	3	7	1	77	46	NM	0.11			
	22	1495-RC-ISO4	40	17	104	45	24	123	16	820	486	NM	0.69	14.2	28.5	
			± 6	4	4	9	3	7	1	76	46	NM	0.11			
	23	1495-RC-ISO5	23	10	77	106	15	99	11	NM	NM	NM	NM	37.3	36.5	
			± 8	4	4	9	3	7	1	NM	NM	NM	NM			
	24	RC1-2-1-1A	70	19	172	70	42	215	11	769	180	NM	0.94	58.8	40.3	
			± 8	5	4	9	3	7	2	76	45	NM	0.11			
	25	RC1-2-1-1B	67	23	158	67	40	204	12	536	174	NM	0.74	49.6	46.7	
			± 9	5	4	9	3	7	2	75	45	NM	0.11			
	26	RC1-2-2-1A	49	22	152	63	41	208	11	896	222	NM	1.25	59.1	45.0	
			± 8	4	4	9	3	7	1	76	46	NM	0.11			
	27	RC1-2-2-1B	55	16	131	58	37	200	11	1379	280	NM	1.65	58.5	38.0	
			± 7	4	4	9	3	7	1	77	46	NM	0.11			
	28	RC1-2-3-1A	27	11	89	120	16	104	7	464	239	NM	0.76	34.6	55.5	
			± 8	4	4	9	3	7	1	75	46	NM	0.11			
	29	RC1-2-3-1B	55	22	154	71	47	298	20	NM	NM	NM	NM	55.7	47.1	
			± 8	4	4	9	3	7	1	NM	NM	NM	NM			
	30	RC1-2-3-1C	45	18	140	60	38	204	10	703	234	NM	1.17	52.5	54.1	
			± 7	4	4	9	3	7	1	76	46	NM	0.11			

All trace element values reported in parts per million; ± = analytical uncertainty estimate (in ppm). Iron content reported as weight percent oxide. NA = Not available; ND = Not detected; NM = Not measured.; \* = Small sample.

# Northwest Research Obsidian Studies Laboratory

Table A-1. Results of XRF Studies: Redmond Caves Vicinity Sites, Deschutes County, Oregon

Site	Specimen No.	Catalog No.	Trace Element Concentrations											Ratios		Source
			Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe <sub>2</sub> O <sub>3</sub> <sup>†</sup>	Fe:Mn	Fe:Ti	
(b) (5) Cultural Resource	31	RC1-2-3-1D	36 ± 7	43 4	151 4	61 9	41 3	206 7	13 1	925 76	240 46	NM NM	1.32 0.11	56.5	45.8	(b) (5) Cultural Resource (NHPA, Sec. 106)
	32	RC1-2-3-1E	39 ± 7	17 4	140 4	60 9	39 3	201 7	13 1	928 77	344 46	NM NM	1.46 0.11	41.3	50.3	
	33	RC1-2-3-1F	61 ± 7	28 4	165 4	68 9	43 3	217 7	12 1	1047 77	400 46	NM NM	1.69 0.11	40.2	51.3	
	34	RC1-2-3-1G	53 ± 7	24 4	138 4	61 9	40 3	203 7	12 1	923 77	341 46	NM NM	1.50 0.11	42.9	52.0	
	35	RC1-2-3-1H	49 ± 8	26 4	160 4	68 9	44 3	209 7	12 1	571 76	178 46	NM NM	0.93 0.11	59.0	53.6	
	36	RC1-2-4-2A	43 ± 7	26 4	155 4	65 9	38 3	206 7	11 1	976 77	269 46	NM NM	1.53 0.11	57.1	49.9	
	37	RC1-2-4-2B	62 ± 8	26 4	170 4	72 9	44 3	221 7	12 1	672 76	207 46	NM NM	1.07 0.11	56.1	52.2	
	38	RC1-2-5-1	51 ± 7	25 4	152 4	62 9	41 3	212 7	12 1	822 76	245 46	NM NM	1.27 0.11	53.7	50.0	
	39	RC4-1-1-1A	40 ± 8	19 5	132 4	57 9	38 3	201 7	12 1	853 76	207 46	NM NM	1.10 0.11	57.0	41.9	
	40	RC4-1-1-1B	54 ± 8	21 4	133 4	58 9	38 3	203 7	10 1	1266 77	266 46	NM NM	1.54 0.11	58.3	38.8	
	41	RC4-1-1-1C	38 ± 8	19 4	133 4	63 9	39 3	207 7	11 1	1427 78	264 46	NM NM	1.61 0.11	61.2	35.8	
	42	RC4-1-2-1A	57 ± 7	23 4	148 4	63 9	38 3	210 7	11 1	965 76	225 46	NM NM	1.23 0.11	57.3	41.1	
	43	RC4-1-2-1B	55 ± 9	21 5	165 4	70 9	42 3	216 7	11 2	NM NM	NM NM	NM NM	NM NM	53.8	46.6	
	44	RC4-1-3-1A	54 ± 7	41 4	137 4	57 9	39 3	197 7	11 1	1168 77	257 46	NM NM	1.48 0.11	58.4	40.5	
	45	RC4-1-3-1B	35 ± 8	19 4	143 4	64 9	41 3	208 7	13 1	NM NM	NM NM	NM NM	NM NM	63.3	43.8	

All trace element values reported in parts per million; ± = analytical uncertainty estimate (in ppm). Iron content reported as weight percent oxide.  
 NA = Not available; ND = Not detected; NM = Not measured; \* = Small sample.

# Northwest Research Obsidian Studies Laboratory

Table A-1. Results of XRF Studies: Redmond Caves Vicinity Sites, Deschutes County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe <sub>2</sub> O <sub>3</sub> <sup>T</sup>	Fe:Mn	Fe:Ti	
(b) (3) Cultural Resources	46	RC4-1-4-1A	41 ± 8	23 4	149 4	63 9	39 3	205 7	11 1	NM NM	NM NM	NM NM	NM NM	62.5	31.9	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
	47	RC4-1-4-1B	52 ± 7	22 4	147 4	61 9	44 3	214 7	11 1	789 76	208 46	NM NM	1.17 0.11	60.1	48.0	
	48	RC4-2-1-1A	34 ± 8	23 4	129 4	59 9	37 3	200 7	12 1	1495 78	279 46	NM NM	1.65 0.11	58.8	35.0	
	49	RC4-2-1-1B	57 ± 7	16 4	151 4	65 9	41 3	213 7	9 1	1062 77	221 46	NM NM	1.24 0.11	59.1	37.7	
	50	RC4-2-1-1C	55 + 7	24 4	138 4	63 9	38 3	208 7	12 1	1518 78	259 46	NM NM	1.61 0.11	62.7	33.8	
	51	RC4-2-2-1A	46 ± 7	15 4	134 4	61 9	38 3	205 7	10 1	929 76	220 46	NM NM	1.25 0.11	60.0	43.6	
	52	RC4-2-2-1B	45 ± 8	21 4	156 4	65 9	41 3	216 7	10 1	696 76	178 45	NM NM	0.86 0.11	55.1	41.2	
	53	RC4-2-3-1	47 ± 7	22 4	142 4	60 9	37 3	205 7	12 1	NM NM	NM NM	NM NM	NM NM	60.9	55.2	
	RGM-1	RGM-1	33 ± 7	25 4	155 4	104 9	26 3	225 7	10 1	1596 77	342 46	NM NM	1.80 0.11	50.8	35.7	

All trace element values reported in parts per million; ± = analytical uncertainty estimate (in ppm). Iron content reported as weight percent oxide.  
 NA = Not available; ND = Not detected; NM = Not measured; \* = Small sample.

# Northwest Research Obsidian Studies Laboratory

Table B-1. Obsidian Hydration Results and Sample Provenience: Redmond Caves Vicinity Sites, Deschutes County, Oregon

Site	Specimen		Unit	Depth	Type <sup>A</sup>	Source	Hydration Rims		Comments <sup>B</sup>
	No.	Catalog No.					Rim 1	Rim 2	
	1	1-11932A	--	--			NA ± NA	NM ± NM	
	2	1-11932B	--	--			2.2 ± 0.0	NM ± NM	
	3	1-11932C	--	--			2.1 ± 0.1	NM ± NM	
	4	1-11918D	--	--			2.6 ± 0.1	NM ± NM	
	5	1-11932E	--	--			3.2 ± 0.1	NM ± NM	
	6	1-11922F	--	--			2.0 ± 0.1	NM ± NM	
	7	1-11939G	--	--			2.4 ± 0.1	NM ± NM	
	8	1-11939H	--	--			2.1 ± 0.0	NM ± NM	
	9	1-11925I	--	--			2.6 ± 0.1	NM ± NM	
	10	1-11932J	--	--			2.2 ± 0.1	NM ± NM	
	11	1-11925K	--	--			2.1 ± 0.1	NM ± NM	
	12	1-11939L	--	--			2.0 ± 0.1	NM ± NM	
	13	1-11918M	--	--			2.0 ± 0.1	NM ± NM	
	14	1-11939N	--	--			2.1 ± 0.1	NM ± NM	
	15	1-11939O	--	--			2.0 ± 0.1	NM ± NM	
	16	1-11938P	--	--			2.1 ± 0.1	NM ± NM	
	17	1-11923Q	--	--			2.4 ± 0.1	NM ± NM	
	18	1-11924R	--	--			3.1 ± 0.1	NM ± NM	
	19	1495-RC1-S-1	--	--			NM ± NM	NM ± NM	
	20	1495-RC7-S-1	--	--			NM ± NM	NM ± NM	
	21	1495-RC-ISO3	--	--			NM ± NM	NM ± NM	
	22	1495-RC-ISO4	--	--			NM ± NM	NM ± NM	
	23	1495-RC-ISO5	--	--			NM ± NM	NM ± NM	

<sup>A</sup> BIF = Biface; DEB = Debitage; PPT = Projectile Point

<sup>B</sup> See text for explanation of comment abbreviations

NA = Not Available; NM = Not Measured; \* = Small sample

# Northwest Research Obsidian Studies Laboratory

Table B-1. Obsidian Hydration Results and Sample Provenience: Redmond Caves Vicinity Sites, Deschutes County, Oregon

Site	Specimen		Unit	Depth	Type <sup>A</sup>	Hydration Rims		Comments <sup>B</sup>
	No.	Catalog No.				Rim 1	Rim 2	
(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	24	RC1-2-1-1A	TP 2	0-10	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	NA ± NA	NM ± NM	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
	25	RC1-2-1-1B	TP 2	0-10		NA ± NA	NM ± NM	
	26	RC1-2-2-1A	TP 2	10-20		NA ± NA	NM ± NM	
	27	RC1-2-2-1B	TP 2	10-20		4.8 ± 0.1	NM ± NM	
	28	RC1-2-3-1A	TP 2	20-30		3.1 ± 0.1	NM ± NM	
	29	RC1-2-3-1B	TP 2	20-30		3.2 ± 0.1	NM ± NM	
	30	RC1-2-3-1C	TP 2	20-30		5.4 ± 0.1	NM ± NM	
	31	RC1-2-3-1D	TP 2	20-30		4.9 ± 0.1	NM ± NM	
	32	RC1-2-3-1E	TP 2	20-30		NA ± NA	NM ± NM	
	33	RC1-2-3-1F	TP 2	20-30		5.1 ± 0.1	NM ± NM	
	34	RC1-2-3-1G	TP 2	20-30		5.4 ± 0.1	NM ± NM	
	35	RC1-2-3-1H	TP 2	20-30		5.1 ± 0.1	NM ± NM	
	36	RC1-2-4-2A	TP 2	30-40		5.2 ± 0.0	NM ± NM	
	37	RC1-2-4-2B	TP 2	30-40		5.0 ± 0.1	NM ± NM	
	38	RC1-2-5-1	TP 2	40-50		5.0 ± 0.1	NM ± NM	
	39	RC4-1-1-1A	TP 1	0-5		NA ± NA	NM ± NM	
	40	RC4-1-1-1B	TP 1	0-5		NA ± NA	NM ± NM	
	41	RC4-1-1-1C	TP 1	0-5		NA ± NA	NM ± NM	
	42	RC4-1-2-1A	TP 1	5-10		NA ± NA	NM ± NM	
	43	RC4-1-2-1B	TP 1	5-10		NA ± NA	NM ± NM	
	44	RC4-1-3-1A	TP 1	0-15		NA ± NA	NM ± NM	
	45	RC4-1-3-1B	TP 1	0-15		NA ± NA	NM ± NM	
	46	RC4-1-4-1A	TP 1	15-20		NA ± NA	NM ± NM	

<sup>A</sup> BIF = Biface; DEB = Debitage; PPT = Projectile Point

<sup>B</sup> See text for explanation of comment abbreviations

NA = Not Available; NM = Not Measured; \* = Small sample



# Northwest Research Obsidian Studies Laboratory

Table B-1. Obsidian Hydration Results and Sample Provenience: Redmond Caves Vicinity Sites, Deschutes County, Oregon

Site	Specimen		Unit	Depth	Type <sup>A</sup>	Source	Hydration Rims		Comments <sup>B</sup>
	No.	Catalog No.					Rim 1	Rim 2	
(b) (1) Cultural Resource	47	RC4-1-4-1B	TP 1	15-20	(b) (3) Cultural Resources (ARPA, Sec. 304, NH-PA)		NA ± NA	NM ± NM	(b) (3) Cultural Resources (ARPA, Sec. 304, NH-PA)
	48	RC4-2-1-1A	TP 2	0-5			NA ± NA	NM ± NM	
	49	RC4-2-1-1B	TP 2	0-5			NA ± NA	NM ± NM	
	50	RC4-2-1-1C	TP 2	0-5			NA ± NA	NM ± NM	
	51	RC4-2-2-1A	TP 2	5-10			NA ± NA	NM ± NM	
	52	RC4-2-2-1B	TP 2	5-10			NA ± NA	NM ± NM	
	53	RC4-2-3-1	TP 2	10-15			5.3 ± 0.1	NM ± NM	

<sup>A</sup> BIF = Biface; DEB = Debitage; PPT = Projectile Point

<sup>B</sup> See text for explanation of comment abbreviations

NA = Not Available; NM = Not Measured; ± = Small sample

## Abbreviations and Definitions Used in the Comments Column

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All hydration rim measurements are recorded in microns.

**BEV** - (Beveled). [REDACTED] morphology or cut configuration resulted in a beveled thin section edge.

**BRE** - (BREak). The thin section cut was made across a broken edge of the [REDACTED]. Resulting hydration measurements may reveal when the [REDACTED] was broken, relative to its time of manufacture.

**DES** - (DEStroyed). The [REDACTED] was destroyed in the process of thin section preparation. This sometimes occurs during the preparation of extremely small items, such as [REDACTED].

**DFV** - (Diffusion Front Vague). The diffusion front, or the visual boundary between hydrated and unhydrated portions of the specimen, are poorly defined. This can result in less precise measurements than can be obtained from sharply demarcated diffusion fronts. The technician must often estimate the hydration boundary because a vague diffusion front often appears as a relatively thick, dark line or a gradation in color or brightness between hydrated and unhydrated layers.

**DIS** - (DIStcontinuous). A discontinuous or interrupted hydration rind was observed on the thin section.

**HV** - (Highly Variable). The hydration rind exhibits variable thickness along continuous surfaces. This variability can occur with very well- defined bands as well as those with irregular or vague diffusion fronts.

**IRR** - (IRRegular). The surfaces of the thin section (the outer surfaces of the artifact) are uneven and measurement is difficult.

**ISO** - (1 Surface Only). Hydration was observed on only one surface or side of the thin section.

**NOT** - (NOT obsidian). Petrographic characteristics of the [REDACTED] or obsidian specimen indicate that the specimen is not obsidian.

**NVH** - (No Visible Hydration). No hydration rind was observed on one or more surfaces of the specimen. This does not mean that hydration is absent, only that hydration was not observed. Hydration rinds smaller than one micron often are not birefringent and thus cannot be seen by optical microscopy. "NVH" may be reported for the manufacture surface of a tool while a hydration measurement is reported for another surface, e.g. a remnant ventral flake surface.

**OPA** - (OPAque). The specimen is too opaque for measurement and cannot be further reduced in thickness.

**PAT** - (PATinated). This description is usually noted when there is a problem in measuring the thickness of the hydration rind, and refers to the unmagnified surface characteristics of the artifact, possibly indicating the source of the measurement problem. Only extreme patination is normally noted.

**REC** - (RECut). More than one thin section was prepared from an archaeological specimen. Multiple thin sections are made if preparation quality on the initial specimen is suspect or obviously poor. Additional thin sections may also be prepared if it is perceived that more information concerning an artifact's manufacture or use can be obtained.

**UNR** - (UNReadable). The optical quality of the hydration rind is so poor that accurate measurement is not possible. Poor thin section preparation is not a cause.

**WEA** - (WEAthered). The artifact surface appears to be damaged by wind erosion or other mechanical action.

**Oregon Archaeological Survey**  
University of Oregon, Museum of Natural History

**Redmond Caves**

Site No.

County **Deschutes**Cultural Area **Tenino/Northern Paiute**Type of Site **five (5) lava tube/caves**Property Location **(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)****(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)**Site Location **UTM Zone** **(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)** From **N** **(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)** E **(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)** to **N** **(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)** **(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)**Site Description **5 large lava tubes/caves** **(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)**  
**(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)**Area of occupation **(width)(deep)**  
**caves range from 12 x 25 m to 25 x 50+m in floor area**Depth and character of fill **aeolian sandy loam; unknown depth, but potentially 3-4 m**Vegetation cover **juniper, sagebrush, cheat grass outside of caves**Present condition **disturbed by relic collectors, partiers, sight-seers, etc.**Material collected or observed **tested in 1941 by Robert F. Heizer;** **(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)** **stored**  
**at University of Oregon include** **(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)**Recommendations for future work **test for undisturbed sediments**Owner and address **(?) city of Redmond (?) BLM** **private** **Attitude toward excavation** **unknown**Present use **spelunking, partying, and general activities that disturb the integrity**  
**of the site and sediments****N.****(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)** Photograph Nos. **none****(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)****7.5' quad**Recorded by **R. Lee Lyman**Date **6 September 1983**

Scale

(when square represents a section 1 inch = 402 m)



**CITY OF REDMOND**  
DESCHUTES COUNTY, OREGON

Location Address - 716 SW EVERGREEN  
Mailing Address - P.O. BOX 726  
REDMOND, OR 97756-0100  
(541) 923-7710

Public Works Department

AIRPORT 504-3495  
COMMUNITY DEVELOPMENT 323-7721  
PUBLIC WORKS 504-2000

**STAFF REPORT**

DATE: April 6, 1999  
TO: Mayor and City Council  
FROM: Mary Meloy, Public Works Director  
THROUGH: Joe Hannan, City Manager  
SUBJECT: Redmond Caves



Report in Brief: This is to forward the Parks Commission recommendation to adopt the Redmond Caves Master Plan and to approve an application to lease the [REDACTED] Redmond Caves site.

Background: The purpose of the project was to develop a management plan to rehabilitate, preserve and maintain the resources of the Redmond Caves, a naturally occurring series of caves or lava tubes, located in Deschutes County [REDACTED] of the City of Redmond. The caves are located on a [REDACTED] parcel managed by BLM.

The City of Redmond and BLM have entered into a joint agreement for the management of the Redmond Caves. The joint agreement indicates that the City is responsible for preparing a master plan that describes how best to rehabilitate, preserve, and maintain the resources of the Redmond caves site. In keeping with the City of Redmond Parks Master Plan, this project established a City Park in an area where no parks existed. This project was selected by BLM and the City because of the need to develop a specialty recreation area that will preserve and protect a very unique resource for this growing community and secure its perpetual use, enjoyment, and benefit to all members of the public. The caves site provides a very attractive opportunity for interpretation, education, and recreation. It is very accessible, being located near an urban area but needs rehabilitation to repair and keep up with the high levels of damage from ongoing misuse of the site.

Discussion: The goal of this Master Plan is to establish basic guidelines for development and management of the site. The emphasis is on providing opportunities for the public to learn appropriate caving behavior and the resource values associated with Oregon's lava tube caves. In particular, the participants in this planning effort hope that the Redmond caves site could be used to teach the public good safety and preservation behaviors that would help protect more remote and less disturbed caves. The challenge was to develop a Master Plan that would rehabilitate, protect, and manage the caves site for both recreation and education.

In order for the City to follow through on the Caves Master Plan, BLM indicated that it would be best for the City to lease the parcel. The City has more flexibility to develop the park to the standards outlined in the master plan than does BLM. As stated in this Master Plan, the City of Redmond intends to lease the caves site under the Recreation and Public Purposes Act (R&PP). The site plan will be submitted with the lease application. The lease amount will either be \$0 or very low cost to the City. It is understood that the BLM will prepare an environmental assessment for the lease at their cost.

Fiscal Impact: None

**Options:**

- 1) Adopt the Redmond Caves Master Plan and approve the resolution for the submittal of an application to BLM to lease the caves site under the Recreation and Public Purposes Act.
- 2) Reject the Redmond Caves Master Plan and lease application.
- 3) Request additional information.

**Recommendation:**

**Option #1, Adopt the Redmond Caves Master Plan and the approve the resolution for the submittal of the lease application to BLM.**

  
Mary Meloy, Director of Public Works

cc: Parks Commission  
BLM  
USDA Forest Service

SITE STATISTICS	
TRAIL TOTAL	6100 LP (40200 SF)
NEW DISTURBED AREAS FOR TRAILS, PARKING, & OUTDOOR CLASSROOM	7100 SF
14' PAVED ROAD	350 LP (4900 SF)
14' GRAVEL ROAD	500 LP (7000 SF)
WOOD RAIL FENCE	1830 LP
WIRE FENCE	2380 LP
PARKING AREA	4093 SF
LAWN AREA	60806 SF



**Central Oregon Heritage Group**  
**CULTURAL RESOURCE SITE RECORD**

**ADMINISTRATIVE DATA**

SITE NUMBER: [REDACTED] SMITHSONIAN NUMBER:  
OTHER TEMP. NO(S): [REDACTED]  
PROJECT NUMBER:  
OWNER: BLM  
MANAGEMENT LOCATION: Prineville  
COUNTY: Deschutes STATE: Oregon  
SITE NAME: [REDACTED]

**LOCATIONAL DATA**

**LEGAL DESCRIPTION:** (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

UTM: Zone: [REDACTED] Easting: [REDACTED] Northing: [REDACTED]  
GPS (corrected, uncorrected, none, unknown): Yes GPS DATUM:  
USGS QUAD(S) NAME: [REDACTED] SERIES: 7.5' DATE: 1962  
MAP PROJECTION DATUM: NAD27

Describe access to site from permanent feature and how to find primary datum:

On the south side of Redmond (Figure 1), (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) This is the [REDACTED] of the Redmond Caves Parcel. [REDACTED] is located on the [REDACTED] of the parcel (Figure 2). Park in main entrance to parcel (at gate) and walk North along main dirt road. Site is located approximately 200 meters from parking area.

**ENVIRONMENTAL DATA**

BASIN: Deschutes River Basin SUB-BASIN: Deschutes PROVINCE: High Lava Plains

ELEVATION: 3070 Feet SLOPE: 0-5% ASPECT: North

DEPOSITIONAL ENVIRONMENT ON SITE: Volcanic

**SURFACE SEDIMENT TEXTURE ON SITE: (Check as many as needed.)**

sand	silt	clay	gravel	bedrock	cinders	other
X	X		X			

**SITE SETTING**

Vegetation On Site: Juniper, sagebrush, rabbitbrush

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

**VEGETATION**

On Site: Vegetation includes sagebrush, scattered juniper, and rabbitbrush

Surrounding Site: Indian rice grass and Great Basin wild rye.

## WATER SOURCE

## Water Sources (multiple entries possible)

Name	Water Type	Water Status	Distance from Site in Meters
Deschutes River	River		(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Other environmental features/observations (relevant to site location/formation):

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) is located on a (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) BLM managed parcel near Redmond (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). Vegetation at the site includes low sagebrush and rabbitbrush shrubs and scattered junipers. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) grasses, such as Great Basin Wild Rye and Indian Rice Grass grow in the vicinity. The (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) acre parcel contains Redmond Caves (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) a series of five underground lava tubes, and (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) other sites (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA).

**(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)**

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) The general topography at the site is relatively flat (0-5% slope).

**RESOURCE DATA**

SITE TYPE(S): (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) in vicinity of a series of 5 caves (lava tubes).

SITE DESCRIPTION: This site is represented by a (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) recovered from 28 probes measuring 50x50 cm. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were found on the surface. No (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were encountered in the probes. No cultural features were identified as the site. Thirteen of the 28 probes (1, 3, 4, 5, 6, 8, 9, 12, 13, 14, 15, 17, 18, and 20) produced (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) on the surface were concentrated primarily along the edges of the roads where loose sediment accumulated. The road was clearly established across the central portion of the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) and deposits were most likely shifted from the center to the edges of the road (see figure 3 for sketch map of site).

SITE AREA: .26 acres

(Formula for the area of an ellipse is  $L \times W \times 3.14/4$ ; to compute acres from square meters divide square meters by 4047.)

CULTURAL DEPTH: (Y/N/U) Up to 80 cm

TYPE OF EVIDENCE FOR CULTURAL DEPTH: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) excavated in 50x50 cm probes

CULTURAL PERIOD(S): Prehistoric, Middle Holocene

METHOD FOR CULTURAL PERIOD DETERMINATION: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

DATE RANGE FOR SITE: Middle to Late Holocene

METHOD FOR SITE DATE RANGE DETERMINATION: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

## SITE CONDITION

CONDITION: Fair

IMPACT AGENT: Heavy vehicle traffic on dirt road that passes through the site.

DESCRIPTION OF DAMAGE: Heavy vehicle traffic on road caused bedrock to extrude on the surface in several places and a general disruption of the site over time. Soil from road proper has been displaced along the edges of the road, resulting in much deeper deposits along the edges and bedrock in the center.

## RESEARCH/SITE TESTING (Y/N):

SITE HAS BEEN TESTED: Yes DATA RECOVERY: No C-14 DATED: No

SURFACE AREA FORMALLY EXCAVATED: 7 sq. meters

VOLUME OF EXCAVATED DEPOSITS: 2.25m<sup>3</sup>

OBSIDIAN SOURCING/HYDRATION: Yes, results in attached report.

(Redmond Caves Archaeological Report: Interim Spring 2004)

COMMENTS: Discovery and reporting of the site is being conducted by the University Of Oregon State Museum of Anthropology in association with the Redmond Caves Archaeological Project. The project involves archaeological investigations of a [REDACTED] BLM managed parcel in Redmond, Oregon.

INTERPRETATION OF SITE FUNCTION: [REDACTED]

**PRESENT USE AND EXPECTED IMPACTS:**

This site is located [REDACTED] of the City of Redmond. The [REDACTED] parcel containing the Redmond Caves is easily accessible to the public. People frequently use the area to hike, exercise their pets, and engage in social activities (such as parties). There is graffiti spray-painted on the rock outcroppings and walls within the caves, garbage dumps (both industrial and personal), and evidence of homeless camping activities in the vicinity. The BLM and the City of Redmond are planning to develop the [REDACTED] parcel into a natural area public park. Archaeological investigations are underway to assess the cultural resources associated with the parcel and to assess any impacts the planned park may have on these resources. The work is being conducted with University of Oregon students in Bend during fall and spring terms; the project is expected to take a total of four to five years. Interim reports are generated after each term and a complete synthesized report will be published at the culmination of the project.

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**MANAGEMENT DATA**

**NATIONAL REGISTER STATUS** (listed, eligible, insufficient data, non-eligible):  
(Provide justification, include discussion of integrity, context, and National Register criteria.)

[REDACTED]

**MANAGEMENT POTENTIAL (Y/N):** [REDACTED]

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

**MANAGEMENT COMMENTS:** The BLM and City of Redmond are planning to develop the [REDACTED] parcel into a natural area public park. Archaeological investigations are underway to assess the cultural resources associated with the parcel and to assess any impacts the planned park may have on these resources. Recommendations on how to reduce any possible detrimental impacts to the site will be included in the final report at the culmination of the Redmond Caves Archaeological Project.

[REDACTED]

**MATERIALS COLLECTED (Y/N):**

[REDACTED]

**DATE(S) COLLECTED:** 4/10/04

**PRESENT LOCATION OF COLLECTION:** State Museum of Anthropology

**DESCRIPTION AND CATALOG NUMBERS OF COLLECTED MATERIALS (diagnostic only):**

1571-RC8-S-2 (Figure 4)

1571-RC8-S-1 (Figure 5)

1571-RC8-S-3 (Figure 6)

**ASSOCIATED REPORTS (PAST PROJECTS):**

Redmond Caves Archaeological Project-Interim Report Fall 2002: report prepared for the BLM and the City of Redmond, compiled and edited by Margaret Helzer, State Museum of Anthropology, University of Oregon

Redmond Caves Archaeological Project-Interim Report Spring 2003: report prepared for the BLM and the City of Redmond, compiled and edited by Margaret Helzer, State Museum of Anthropology, University of Oregon

SITE NUMBER: RC-8

SMITHSONIAN NUMBER:

Redmond Caves Archaeological Project-Interim Report Fall 2004: report prepared for the BLM and the City of Redmond, compiled and edited by Margaret Helzer, State Museum of Anthropology, University of Oregon

REFERENCE(S) CITED: None

NAME OF RECORDER(S): Margaret M. Helzer

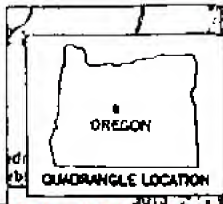
FIELD VISIT DATE: 4/10/04

NAME OF SITE RECORD AUTHOR(S): Margaret M. Helzer

TITLE: Research Archaeologist

NAME OF AGENCY: State Museum of Anthropology, University of Oregon Field Studies Class

SITE RECORD COMPLETION DATE: 7/22/04



(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Figure 1 Location of Redmond Caves Project Area.

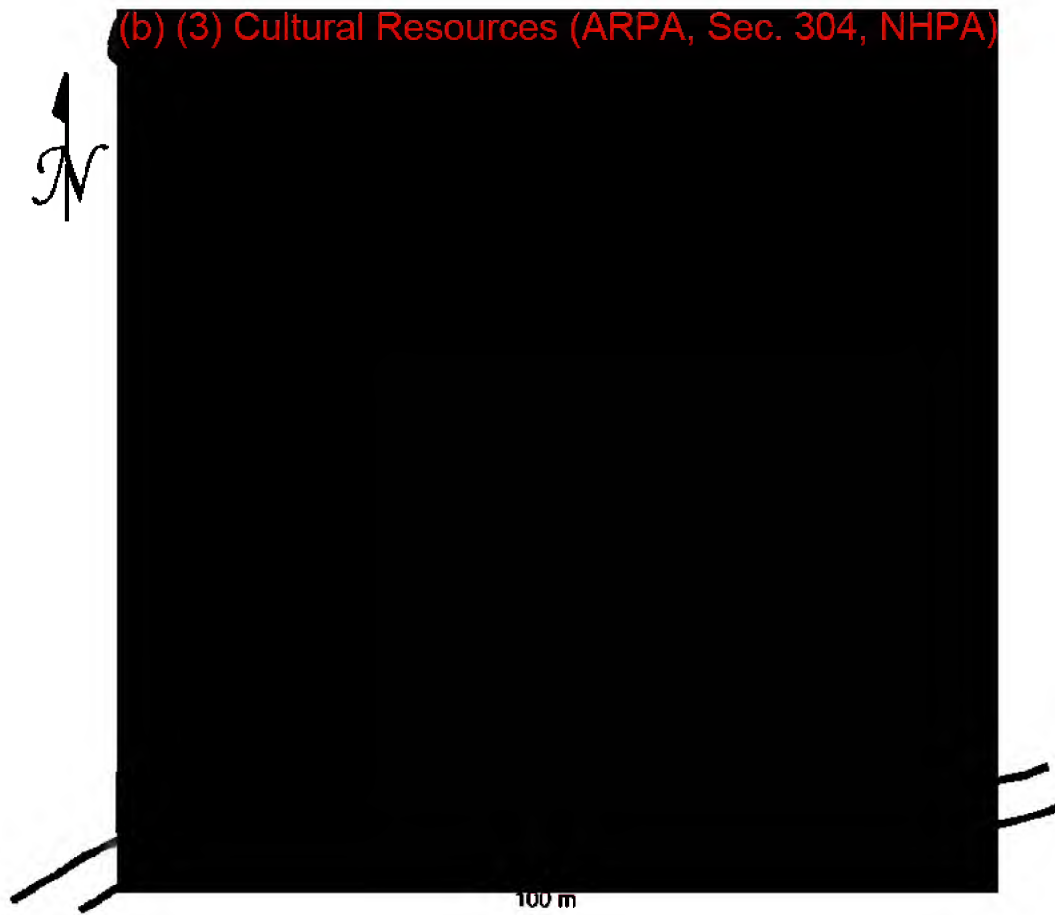


Figure 2. Map of Redmond Caves parcel, showing site locations.



(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

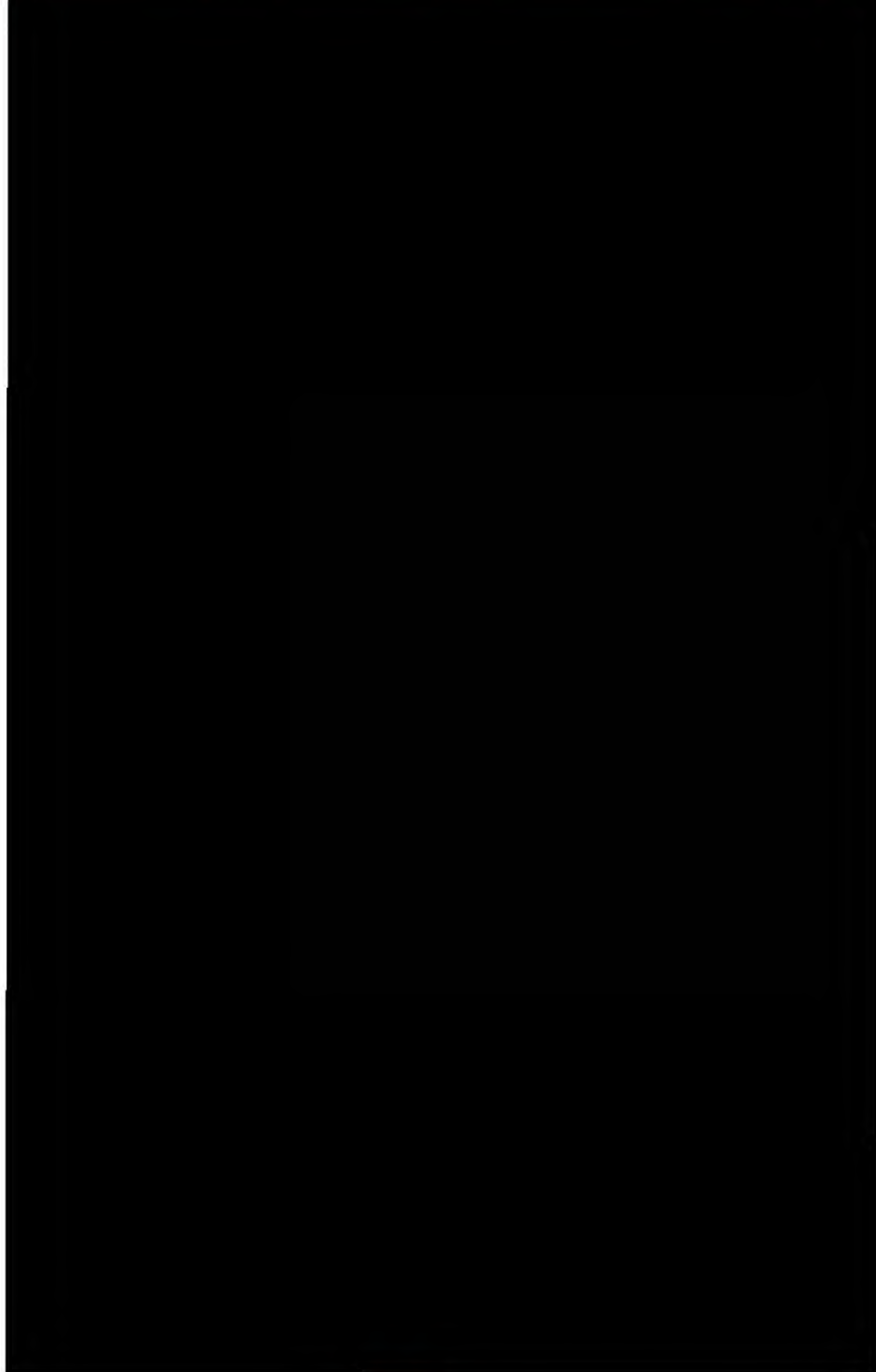


Figure 3. Sketch map of (b) (3) Cultural Resources showing locations of probes.  
Positive probes are shown in red.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure 4 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

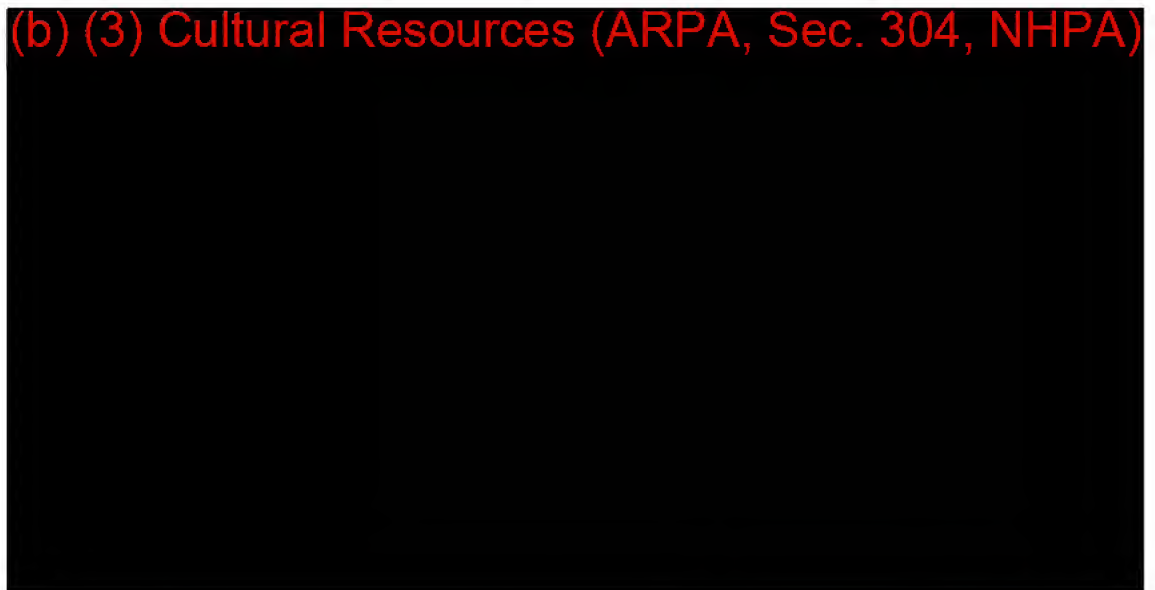


Figure 5 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Figure 6 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Results from Exploratory Probes in

(b) (3) Cultural Resources

Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
1	1	
	2	
	3	
	Total	
Reason for termination: bedrock		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
2	1	
	2	
	3	
	4	
	5	
	Total	
Reason for termination: (b) (3) Cultural Resources sterile		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
3	1	
	Total	
Reason for termination: bedrock		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
4	1	
	2	
	Total	
Reason for termination: bedrock		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
5	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	Total	
Reason for termination: two sterile levels		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
6	1	
	2	
	3	
	4	
	5	
	6	
	Total	
Reason for termination: two sterile levels		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
8	1	
	2	
	3	
	4	
	5	
	Total	
Reason for termination: two sterile levels		

Results from Exploratory Probes in (b) (3) Cultural Resources (cont.)

Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
9	1	
	2	
	3	
	4	
	5	
	Total	
Reason for termination: two sterile levels		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
10	1	
	2	
	3	
	Total	
Reason for termination: (b) (3) Cultural Resources sterile		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
11	1	
	2	
	3	
	Total	
Reason for termination: (b) (3) Cultural Resources sterile		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
12	1	
	2	
	3	
	4	
	5	
	Total	
Reason for termination: bedrock		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
13	1	
	2	
	3	
	4	
	Total	
Reason for termination: bedrock		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
14	1	
	2	
	3	
	Total	
Reason for termination: two sterile levels		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
15	1	
	2	
	3	
	4	
	Total	
Reason for termination: three sterile levels		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
16	1	
	2	
	Total	
Reason for termination: (b) (3) Cultural Resources sterile		

Results from Exploratory Probes in (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (cont.)

Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
17	1	
	Total	
	Reason for termination: bedrock	
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
18	1	
	2	
	3	
	Total	
Reason for termination: two sterile levels		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
19	1	
	2	
	3	
	Total	
Reason for termination: (b) (3) Cultural Resources sterile		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
20	1	
	2	
	3	
	Total	
Reason for termination: two sterile levels		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
21	1	
	2	
	Total	
Reason for termination: bedrock		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
22	1	
	2	
	Total	
Reason for termination: bedrock		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
23	1	
	2	
	3	
	Total	
Reason for termination: (b) (3) Cultural Resources sterile		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
24	1	
	2	
	3	
	Total	
Reason for termination: (b) (3) Cultural Resources sterile		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
25	1	
	2	
	Total	
Reason for termination: bedrock		
Total		(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
Reason for termination: bedrock		

Results from Exploration Probes in RC 8 (cont.)

Probe	Level	
26	1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
	2	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
	2	
	Total	(b) (3) Cultural Resource
	Reason for termination:	sterile
Probe	Level	
27	1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
	2	
	3	
	Total	
	Reason for termination:	(b) (3) Cultural Resource sterile
Probe	Level	
28	1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
	2	
	3	
	Total	(b) (3) Cultural Resource
	Reason for termination:	sterile

## Administrative Data

Smithsonian Number:

Alternate ID Numbers: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

## National Register Status:

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Site Name: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

District: Prineville

County: Deschutes

Agency: Bureau of Land Management

Firm:

Cultural Period(s) (choose one):

Middle Archaic (7,000 BP - 2,000 BP)

## Attachments:

Figure 1: Location of Redmond Caves Project Area

Figure 2: Map of Redmond Caves parcel, showing site locations

Figure 3: Sketch map of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) showing locations of probes. Positive probes shown in red

Figure 4: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) from (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Figure 5: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) from (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Figure 6: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) from (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Table 1: Results from exploratory probes in (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

## Locational Data

Legal Description (nw ne sw se): (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

UTM Zone: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Easting: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Northing: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

USGS Quad Series: 7.5

Quad Name: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Date: 1962

GPS? (y/n): yes

UTM Datum: NAD27



**Describe access to site:**

On the south side of Redmond. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) This is the (b) (3) Cultural Resources (ARPA)  
 parcel. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) is located on the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) of the Redmond Caves  
 parcel. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) is located on the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) of the parcel (figure 2). Park in the main  
 entrance to parcel (at gate) and walk north along main dirt road. Site is located  
 approximately 200 meters from parking area.

**Environmental Data****Province:** High Lava Plains**Drainage:** Deschutes**Basin:** Deschutes River Basin**Elevation (feet):** 3070'**Subbasin:** Deschutes**Aspect:** north**Depositional Environment**

Eolian

Volcanic

**Soil Description:**

Volcanic silt and sand, basalt bedrock, caves (lava tubes) in near vicinity

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

**Vegetation (circle items):**

Lomatium species

Sagebrush

Western Juniper

Wild Rye

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

**Vegetation Description:**

On-site vegetation includes sagebrush, scattered juniper, and rabbitbrush. Indian rice  
 grass and Great Basin wild rye in the site vicinity.

**WATER SOURCES****Name**      **Type****Status****Class****FROM DATUM****Distance**      **Bearing**

Deschutes River

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

**Site Setting (Discuss environmental setting of site relevant to site location, including on-site vegetation, topography, dated landforms and formation processes):**

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) is located on a (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) BLM managed parcel near Redmond (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). Vegetation at the site includes low sagebrush and rabbitbrush shrubs and scattered junipers. Mature juniper trees are present along the perimeter of the site, to the south and the west.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) grasses, such as Great Basin Wild Rye and Indian Rice Grass grow in the vicinity. The (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) parcel contains Redmond Caves (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) a series of five underground lava tubes, and (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) other sites (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA).

**(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)**

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) While low basalt rock outcrops are common in the vicinity of the site, the general topography is relatively flat (0-5% slope).

**Physical Data**

**Site Length (feet meters):** 45 meters

**Site Width (feet meters):** 30 meters

**Depth of Cultural Deposits (centimeters):** up to 80 cm

**Site Area (acres, square feet or square meters):** 1060 sq. meters

**Site Visit Information:**

**Visit Date:** 4/10/04  
**Site Condition:** fair

**Impact Agent(s):**  
erosion, vehicle traffic  
on road which bisects  
the site

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) materials  
**collected?**  
Yes

**Site Conditions (circle):**

Fair - Site damage = or > 40% and < 60%.

**Impact Agents (circle):**

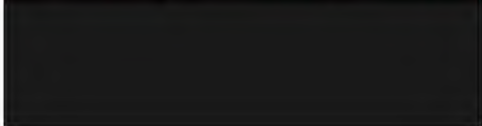
Erosion

Recreation: motorized

Road

**The Following Were Observed: (circle and include details or other artifacts in the site description below).**

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



**Site Description (Include discussion of site condition, found artifacts and other relevant info:**

This site is represented by a (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) recovered from 28 probes measuring 50x50 cm. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were found on the surface. No (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were encountered in the probes. No cultural features were identified as the site. Thirteen of the 28 probes (1, 3, 4, 5, 6, 8, 9, 12, 13, 14, 15, 17, 18, and 20) produced (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) on the surface were concentrated primarily along the edges of the roads where loose sediment accumulated. The road was clearly established across the central portion of the lithic scatter, and deposits were most likely shifted from the center to the edges of the road (see figure 3 for sketch map of site).

**Present Use and Expected Impacts:**

The site is located (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) of the City of Redmond. The (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) parcel containing the Redmond Caves is easily accessible to the public. People frequently use the area to hike, exercise their pets, and engage in social activities (such as parties). There is graffiti spray-painted on the rock outcroppings and walls within the caves, garbage dumps (both industrial and personal), and evidence of homeless camping activities in the vicinity. Overturned rocks at the site may be the result of artifact collectors.

**Site Type(s):**

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

**Functions:**

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

## Report Information

**Report Title:** Redmond Caves Archeological Project, An Interim Report: Spring 2004

**Author(s) name:** Dr. Margaret M. Helzer

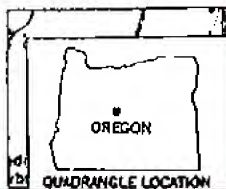
**Primary Report (y/n):** Preliminary report for Redmond Caves Archaeological Project for Spring 2004

**Publication Year:** 2004

**Recorder Name (first, middle initial, last)**  
Margaret M. Helzer  
Research Archaeologist  
Oregon State Museum of Anthropology

**Date Site**  
**Recorded:** 4/10/04  
**Entered or Modified**

University of Oregon



(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Figure 1 Location of Redmond Caves Project Area.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

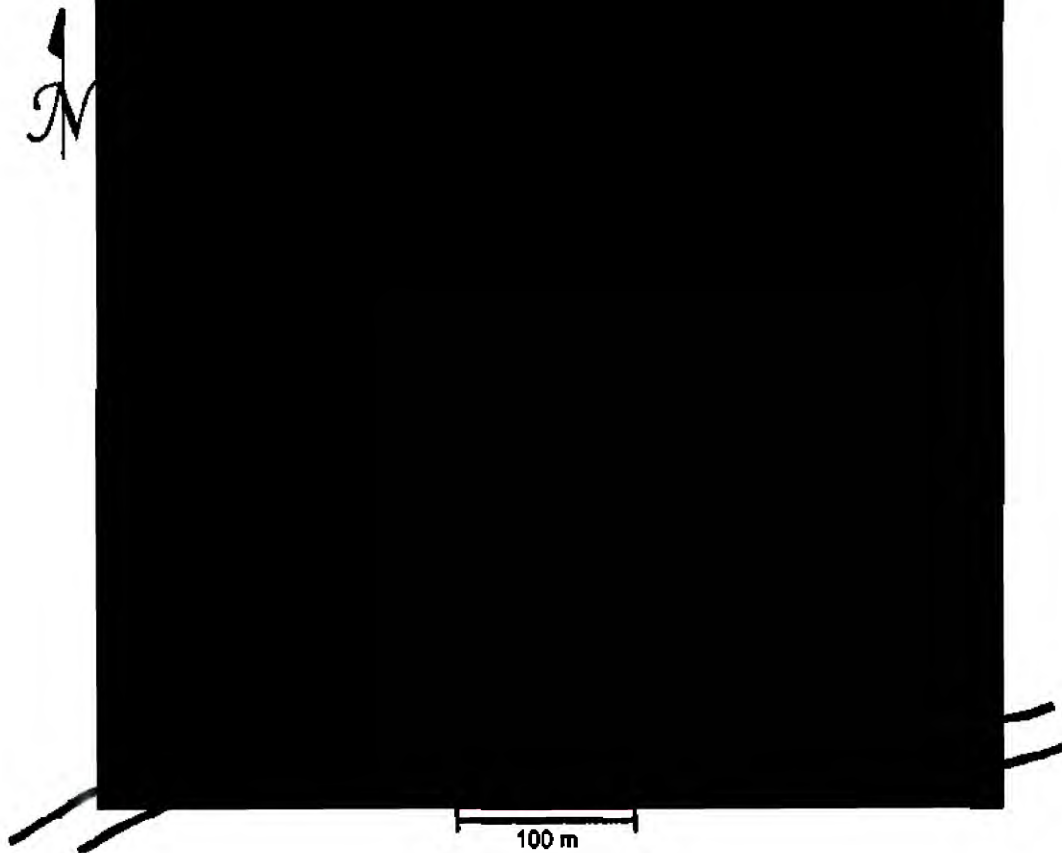


Figure 2. Map of Redmond Caves parcel, showing site locations.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

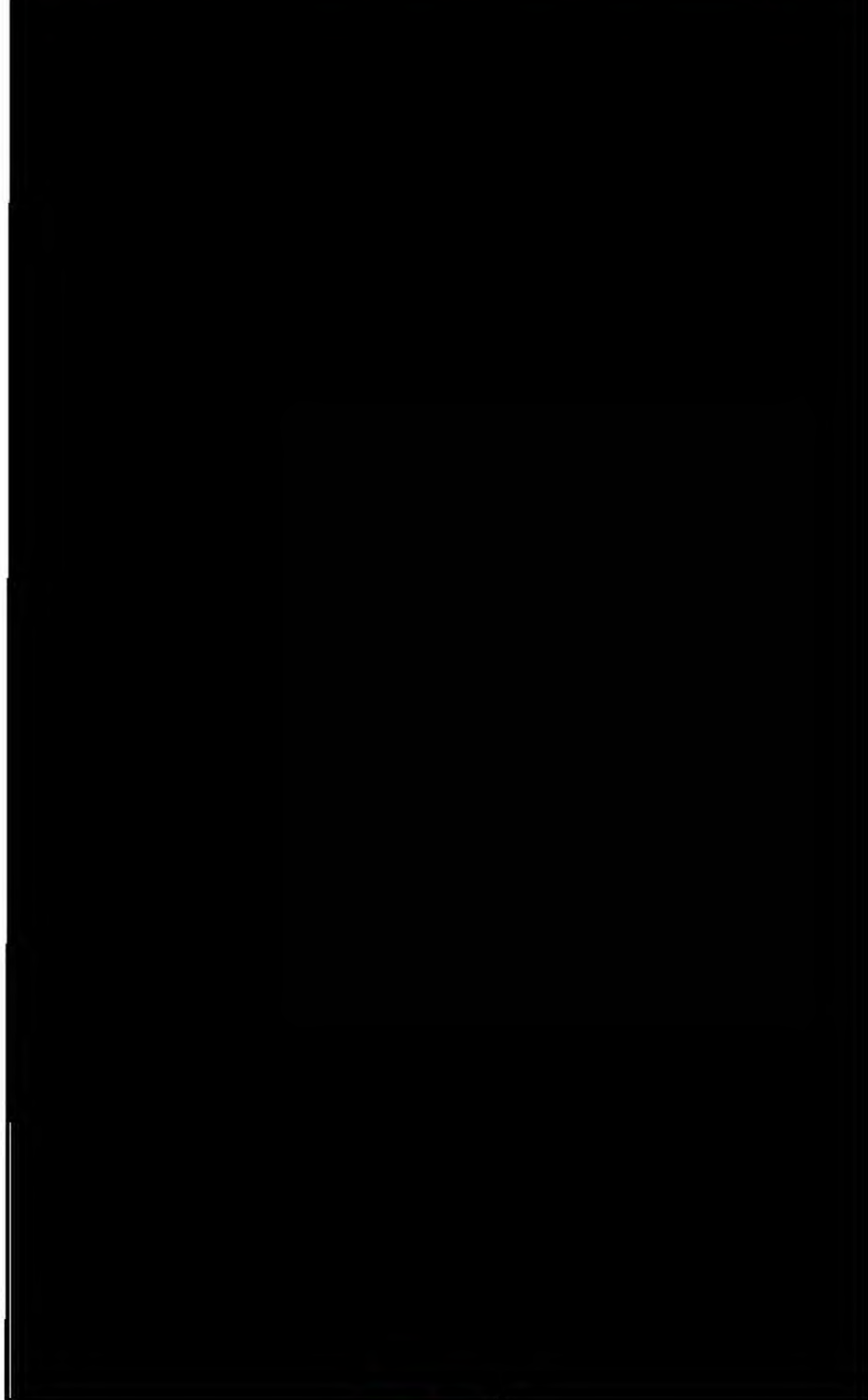



Figure 3. Sketch map of  showing locations of probes.  
Positive probes are shown in red.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure 4 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)




(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure 5 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure 6 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)





Results from Exploratory Probes in

(b) (3) Cultural Resources

Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
1	1	
	2	
	3	
	Total	
Reason for termination: bedrock		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
2	1	
	2	
	3	
	4	
	5	
	Total	
Reason for termination: (b) (3) Cultural Resources sterile		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
3	1	
	Total	
Reason for termination: bedrock		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
4	1	
	2	
	Total	
Reason for termination: bedrock		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
5	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	Total	
Reason for termination: two sterile levels		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
6	1	
	2	
	3	
	4	
	5	
	6	
	Total	
Reason for termination: two sterile levels		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
8	1	
	2	
	3	
	4	
	5	
	Total	
Reason for termination: two sterile levels		

Results from Exploratory Probes in (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	
Probe	Level
9	1
	2
	3
	4
	5
	Total
Reason for termination: two sterile levels	
Probe	Level
10	1
	2
	3
	Total
Reason for termination: (b) (3) Cultural Resources sterile	
Probe	Level
11	1
	2
	3
	Total
Reason for termination: (b) (3) Cultural Resources sterile	
Probe	Level
12	1
	2
	3
	4
	5
	Total
Reason for termination: bedrock	
Probe	Level
13	1
	2
	3
	4
	Total
Reason for termination: bedrock	
Probe	Level
14	1
	2
	3
	Total
Reason for termination: two sterile levels	
Probe	Level
15	1
	2
	3
	4
	Total
Reason for termination: three sterile levels	
Probe	Level
16	1
	2
	Total
Reason for termination: (b) (3) Cultural Resources sterile	

## Results from Exploratory Probes in (b) (3) Cultural Resources (cont.)

Probe	Level	
17	1	
	Total	
	Reason for termination: bedrock	
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
18	1	
	2	
	3	
	Total	
Reason for termination: two sterile levels		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
19	1	
	2	
	3	
	Total	
Reason for termination: (b) (3) Cultural Resources sterile		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
20	1	
	2	
	3	
	Total	
Reason for termination: two sterile levels		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
21	1	
	2	
	Total	
Reason for termination: bedrock		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
22	1	
	2	
	Total	
Reason for termination: bedrock		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
23	1	
	2	
	3	
	Total	
Reason for termination: (b) (3) Cultural Resources sterile		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
24	1	
	2	
	3	
	Total	
Reason for termination: (b) (3) Cultural Resources sterile		
Probe	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
25	1	
	2	
	Total	
Reason for termination: bedrock		
Total		(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
Reason for termination: bedrock		

Results from Exploratory Probes in (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (cont.)

Probe	Level	
26	1	
	2	
	2	
	Total	
Reason for termination:		(b) (3) Cultural Resources sterile
Probe	Level	
27	1	
	2	
	3	
	Total	
Reason for termination:		(b) (3) Cultural Resources sterile
Probe	Level	
28	1	
	2	
	3	
	Total	
Reason for termination:		(b) (3) Cultural Resources sterile

## Redmond Cave

(b) (3) Cultural Resources

(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)

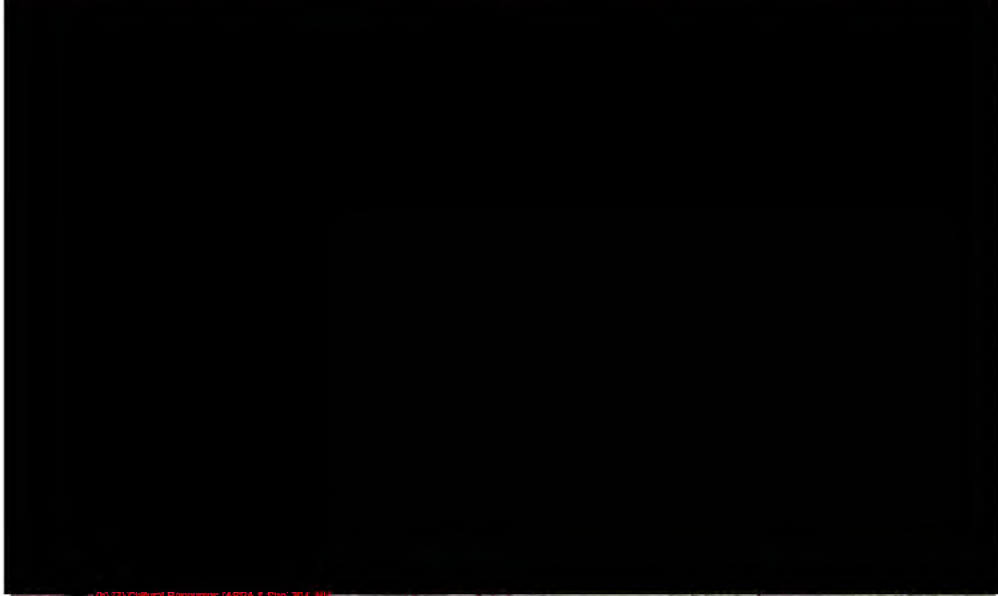


Figure 1.1.

(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)

Note the heavy growth of Great Basin wild rye around the entrance.

### Excavation and Artifact Summary

(b) (3) Cultural Resources is the centerpiece of the lava tube complex (Figure 1.1). Situated near the center of the parcel, at least five two-track roads approach the cave from various directions and meet at another that encircles it. The cave is the most easily accessed, with a wide and deep entrance and high clearance once inside. (b) (3) Cultural Resources has been used for a variety of purposes in historic times. (b) (6) Personal Privacy personal communication 2006) reported regular family outings to the cave during deer season in the 1940s and 1950s, with couches and house furniture brought to the site to furnish it during their stay. The cave has been the central locus of many weekend parties and artifact collecting expeditions over the years and its interior deposits attest to this, with numerous broken bottles, crushed cans, and other historic debris churned into the sediments by the repeated intrusion of shovel blades (Figure 1.2). (b) (6) Personal Privacy reported that his first visit to (b) (3) Cultural Resources was in 1929, when (b) (3) Cultural Resources covered the floor:

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



(b) (3) Personal Privacy another local resident who dug at the cave in the 1940s, said that even at that time there was a lot of glass and debris to sort through, so they preferred to work in the other “good” cave,





Figure 1.2. Glass, metal, plastic, and other debris was common in screens during the excavations at [REDACTED]

presumably [REDACTED] He reported finding many [REDACTED] at the base of the apron near the entrance of [REDACTED] however, particularly [REDACTED] and [REDACTED]

Other sources indicate that [REDACTED] was still a good place to search for [REDACTED] and other [REDACTED] into the 1970s, but by that time, the heyday of illicit [REDACTED] collecting at Redmond Caves had come and gone. In recent times, the lava tubes have been utilized as transient camps and for adventurous explorations by individuals and families alike. Students who camped on site during the course of the 2005 field season reported steady traffic from around the clock visitors to the caves.

As mentioned previously, the caves have not been treated well for decades and [REDACTED] seems to have borne the brunt of damage. When the decision was made to turn the parcel into a natural park, the Prineville District BLM began the arduous process of mitigating the damage caused by vandalism over the years. The [REDACTED] plot was fenced, gates and barriers were installed at several locations, and periodic trips were made by BLM personnel and volunteer laborers to remove trash and construction debris. By 2006, at least 25,000 pounds of debris had been removed from the land through the BLM effort. During the 2005 and 2006 excavation seasons, we encountered various groups at work cleaning up trash, removing graffiti, and checking fencelines for breaks.

### *Excavations*

The U of O excavated [REDACTED] over the course of two seasons. The [REDACTED] strategy was straightforward in its intent. In 2005, the placement of probes and test units was oriented toward overall evaluation and the identification of areas where intact deposits might be present, both inside and outside of the cave. By the completion of the 2005 field school, no intact cultural deposits had been identified and a

(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)

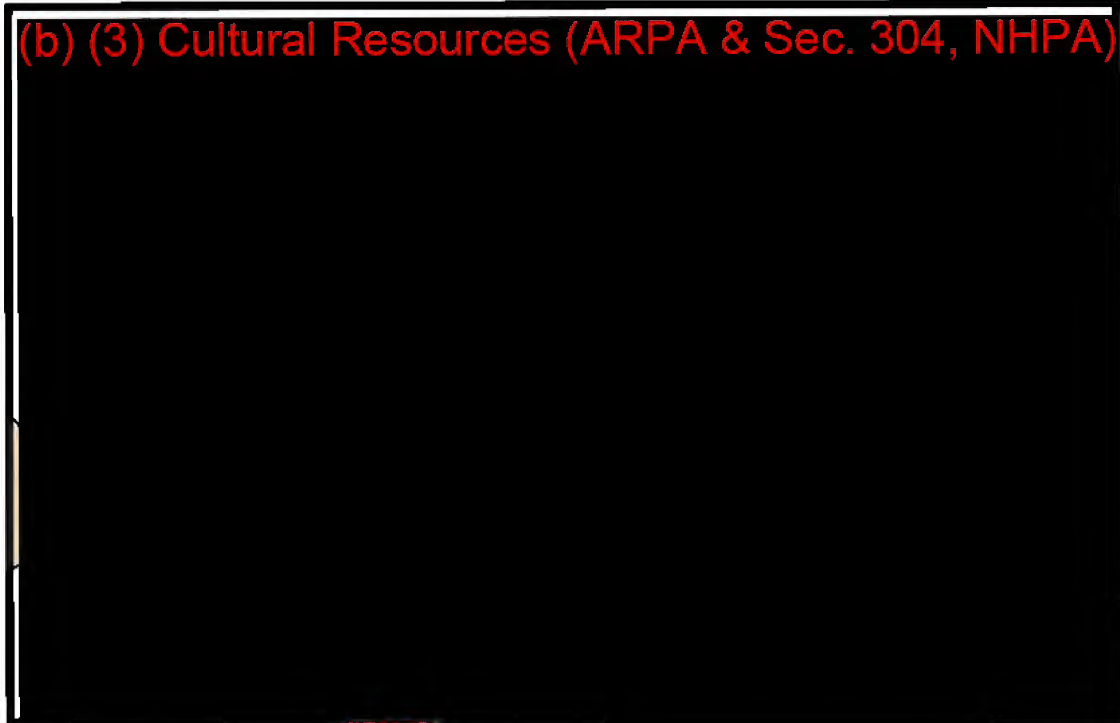
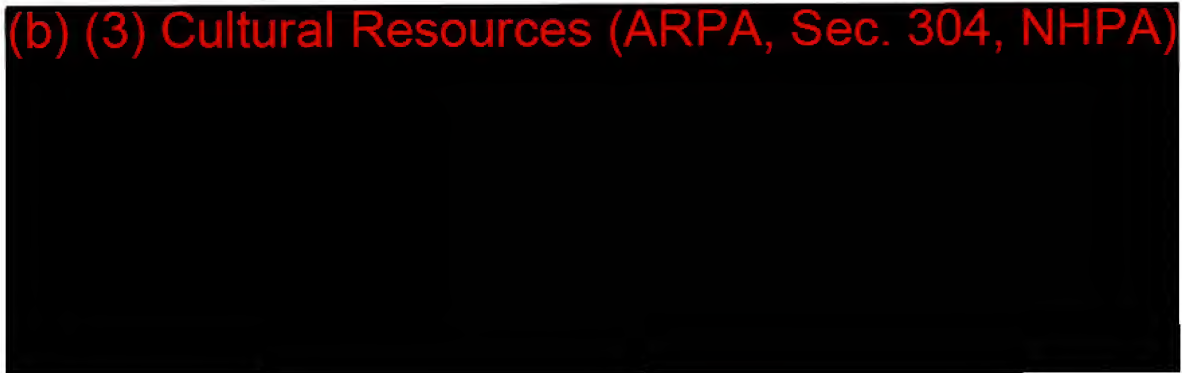


Figure 1.3. Plan view map of (b) (3) Cultural Resources from Helzer (2003). The entrance begins at the constricted area on the left side of the map.

40 W 30 W 20 W 10 W 0 10 E 20 E 30 E 40 E 50 E 60 E 70 E

20 N

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Sketch Map of Excavation Units at Redmond (b) (3) Cultural Resources August, 2005

- site area
- - - limited cave wall
- ~ stream
- well beyond stream

Figure 1.4. Plan view sketch map of (b) (3) Cultural Resources excavations in 2005, showing the locations of 50x50s and 1x1s inside and outside of the cave. The crosses indicate the corners of a 10 meter grid scale.



(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

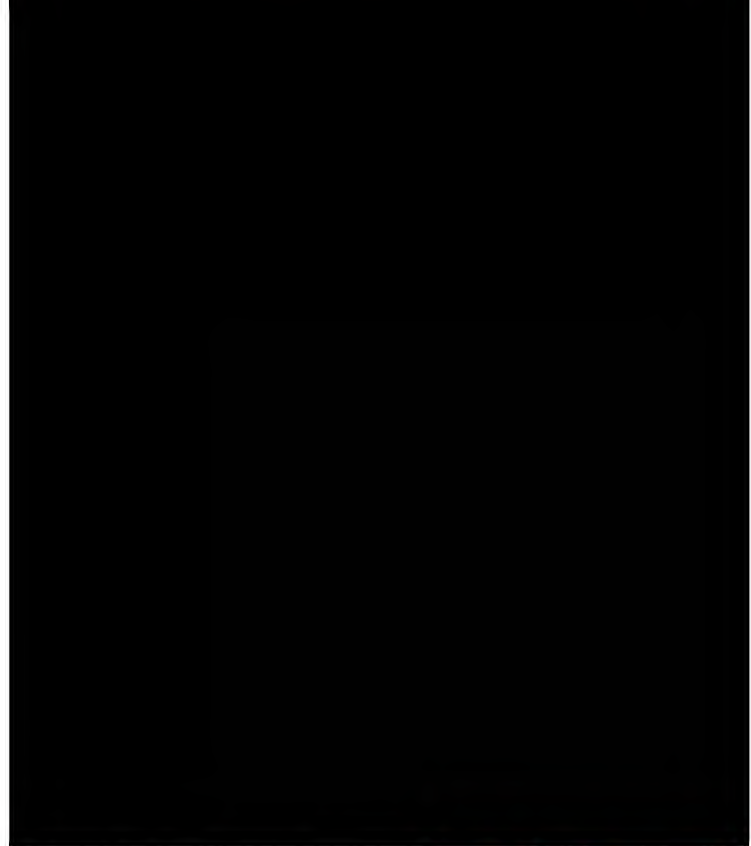


Figure 1.5. Plan view of 2006 excavations in

(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)  
(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)  
(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)



Figure 1.6. The boulder at the entrance of (b) (3) Cultural Resources before, during, and after displacement.  
All of the 2006 excavations occurred in the area under or around its original position.

new strategy was clearly necessary. It was at that time that the idea of utilizing heavy equipment to remove roof fall was developed by University of Oregon archaeologists and approved by Ron Gregory of the Prineville District BLM. The backhoe work took place on May 15, 2006 under the supervision of Patrick O'Grady, field school supervisor, and Terry Holtzapple of the Prineville BLM.

### *The 2005 Excavations*

In 2005, the effort included 49 50x50 cm units, including 20 in front of the cave and 29 inside. Eight larger units consisted of a 1x1 and a 1x2 in front of the cave (Units 3 and 7, respectively), and five 1x1s (Units 1, 2, 4, 6 and 8) and a 2x2 (Unit 5) inside of the cave (Figures 1.3-1.4). (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were recovered during the 2005 season, including (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (Tables 1.2-1.5). Exact counts of the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) can not be offered at this time due to missing catalog inventories. All (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) recovered in 2005 were given an "05" prefix in the cataloguing system.

Generally speaking, (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) deposits outside of the cave were less disturbed than those within. One (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) was found (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) west of the entrance, and some sedimentary stratification was noted in Units 3 and 7, eighteen meters further west of the entrance. Sediments within the cave were heavily disturbed and mottled, and a clear pattern began to develop over the course of the project: In the case of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (from a collector's point of view) that were too large to fit through ¼- or 1/2-inch screen were left behind, presumably cast aside as undesirable for collection purposes. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) and (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) that could fall through ¼-inch screen without notice were more commonly recovered, though still infrequent. No deposits were determined to be intact during the 2005 operations. As a result, the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) material recovered from (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) in 2005 offered a generalized inventory of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) but little insight into trends over time or spatial patterning within the cave.

### *The 2006 Excavations*

The 2006 excavations consisted of two 1x2s (Units 1 and 3) a 2x2 (Unit 2) and a 1x1 (Unit 4). All were dug in close association. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) Recovered (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) included (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) Clear stratigraphic layering was present at this location, including a (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) for radiocarbon dating (Figures 1.7-1.9).

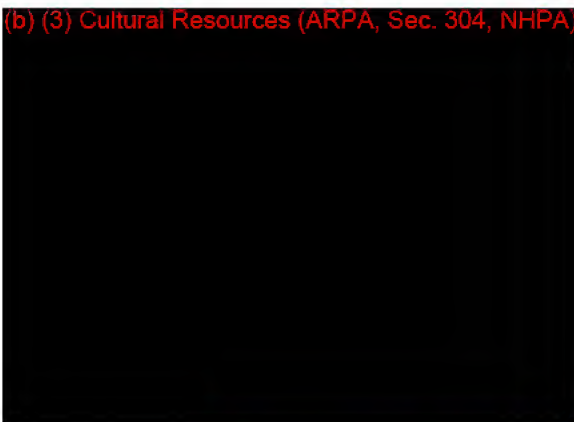


Figure 1.7. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) to right of tape, Unit 3, Quad D, east wall.



Figure 1.8. Stratified deposits, Unit 2, Quad B, east wall.

Table 1.1. Redmond (b) (3) Cultural Resources radiocarbon date.

AMS Sample #	Beta #	Measured Age	Conventional Age	Calib. BP Age (2 $\sigma$ )	Material	Provenience
(b) (3) Cultural Resources (ARPA)	242947	3540 $\pm$ 40 BP	3570 $\pm$ 40 BP	3970 – 3820 3800 – 3730	(b) (3) Cultural Resources (ARPA)	(b) (3) Cultural Resources (ARPA) Unit 3

Bulk sediment samples recovered from (b) (3) Cultural Resources were submitted to Dr. Margaret Helzer for botanical analysis. The (b) (3) Cultural Resources samples produced juniper, sagebrush, and willow (b) (3) Cultural Resources the latter recovered from the (b) (3) Cultural Resources. The (b) (3) Cultural Resources (ARPA) was submitted to Beta Analytic, Inc., for AMS radiocarbon dating. It returned a conventional radiocarbon date of 3540 $\pm$ 40 BP, with calibrated BP intercepts at 3970-3820 BP and 3800-3730 BP (two sigma). This date is in keeping with the (b) (3) Cultural Resources that were recovered from the four units, all of which are large (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA).

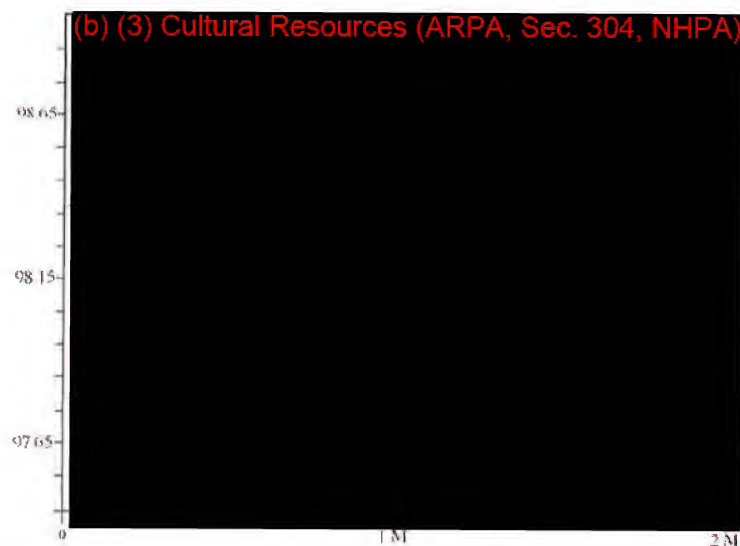


Figure 1.9. Profile drawing of Unit 3, Quad D (0-1 m) and Unit 2 Quad B (1-2 m), east wall.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Strat I: Recent, disturbed surface sediments

Strat II: Similar to I but more consolidated

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

A: Dark brown silts and tephra similar to I and II, (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

B: Dark brown silts with increased clays, distinct from IIIA and IIIC

C: Medium brown silts, sands, and tephra. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

D: Transitional between III and IV, sandier, with more tephra

E: Small pocket similar to III A, C, and D, but reddish brown in color

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

A: Light brown, fine and silty, with increased tephra

B: Substantial tephra concentrations in silts and sands

C: Dark brown highly compacted silts without rocks and pebbles



The 2006 excavations were established on the slope leading down to the level cave floor (Unit 1) and Units 2 and 3 were on the floor itself. Unit 1 produced very small amounts of [REDACTED] material in Quad A [REDACTED] which was located more upslope, but Quad B yielded [REDACTED] in the deeper levels as the excavation merged with the cave surface. Stratigraphy was nonexistent in Unit 1 because an abundance of basalt cobbles and boulders composed the fill, associated with the collapse of the roof over time. Figure 1.9 illustrates the multiple stratigraphic layers within the 2006 [REDACTED] excavations. The layering became more evident as the students worked their way under the original location of the boulder in Units 2 and 3, then dissipated as the intact sediments gave way to disturbance in all directions. The strata were divided into five primary layers which were then subdivided on the basis of subtle attributes in more generalized sediments. Stratum I was composed of loose surface material followed by more consolidated but similar sediments identified as Stratum II. Stratum III held most of the [REDACTED] material, and it was subdivided into components A-E based on color, clay content, and other variables such as gravel and rock content. Stratum III also had high concentrations of [REDACTED]. Stratum IV was composed of sands and silts that were lighter in color, with a high percentage of tephra that provides a orange to tannish cast to the sediments. Stratum V was dark brown, dense, damp, and high in silt content. The latter two strata contained very little [REDACTED] material.

Unit 4 was established to explore the [REDACTED] deposits exposed in the eastern quadrants of Units 2 and 3. It was necessary to remove a large boulder from atop the surface, and the unit was offset 40 cm to the east to avoid other obstacles that included subsurface boulders. The [REDACTED] deposits were not relocated in the unit. While there was some stratigraphic integrity to the deposits there, it was not as pronounced as in Units 2 and 3 and waned to the east. [REDACTED] Cultural Resources (ARPA, Sec. 304, NHPA) were recovered from Unit 4 along with [REDACTED]. The [REDACTED] counts from Unit 4 are not available at this time.

[REDACTED] recovered from the 2006 excavations tend to support our view that the [REDACTED] found in 2005 were either outside of the looting area, too small to remain in ¼ or ½-inch screen, or too fragmented to bring home, from a collector's point of view. [REDACTED] Cultural Resources (ARPA, Sec. 304, NHPA)

**(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)**

[REDACTED] Because the caves are located in an area where multiple cultural influences may be at work, it is best to not assign [REDACTED] typological classifications to [REDACTED] unless clear [REDACTED] attributes are present. [REDACTED] Cultural Resources (ARPA, Sec. 304, NHPA)

**(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)**

[REDACTED] Obsidian hydration rims on the [REDACTED] ranged from 2.0 to 2.5 microns, with a mean of 2.4 for four measurements. Obsidian sources for 2005 [REDACTED] include [REDACTED] (1.9, 2.3, and 2.6 μ), [REDACTED] (1.5 μ), and [REDACTED] (4.9 μ). The [REDACTED] is a [REDACTED] accounting for the thick hydration band.

[REDACTED] that were recovered in 2006 were also submitted for obsidian sourcing and hydration (Table 1.3). A total of [REDACTED] was submitted, including [REDACTED] Cultural Resources (ARPA, Sec. 304, NHPA)

**(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)**

[REDACTED] Obsidian hydration rims ranged from 1.2 to 2.5 microns for [REDACTED] with a mean of 2.0 for [REDACTED]. The [REDACTED] ranged from 1.4 to 2.6 microns with a mean of 2.2 for [REDACTED] specimens. The [REDACTED] Cultural Resources (ARPA, Sec. 304, NHPA) had readings of 4.4, 2.7, and 2.5 μ respectively. The 2005 [REDACTED] came from a broader array of sources that included [REDACTED] (5.8, 2.6, 2.3, 2.1 μ), [REDACTED] (4.8, 4.8 μ), [REDACTED] (3.8 μ), [REDACTED] (3.0 μ), [REDACTED] (1.2 μ), [REDACTED] (2.1 μ), and [REDACTED] (not measureable). The thick hydration readings on [REDACTED] from the [REDACTED] source were collected from a location initially identified as Feature 1, which, unfortunately, turned out to have [REDACTED] underlying it. [REDACTED] were also submitted (Table 1.4), and were found to be [REDACTED] Cultural Resources (ARPA, Sec. 304, NHPA) obsidian with hydration readings of 2.2 to 2.5 microns. The 2005 [REDACTED] revealed a similar range.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

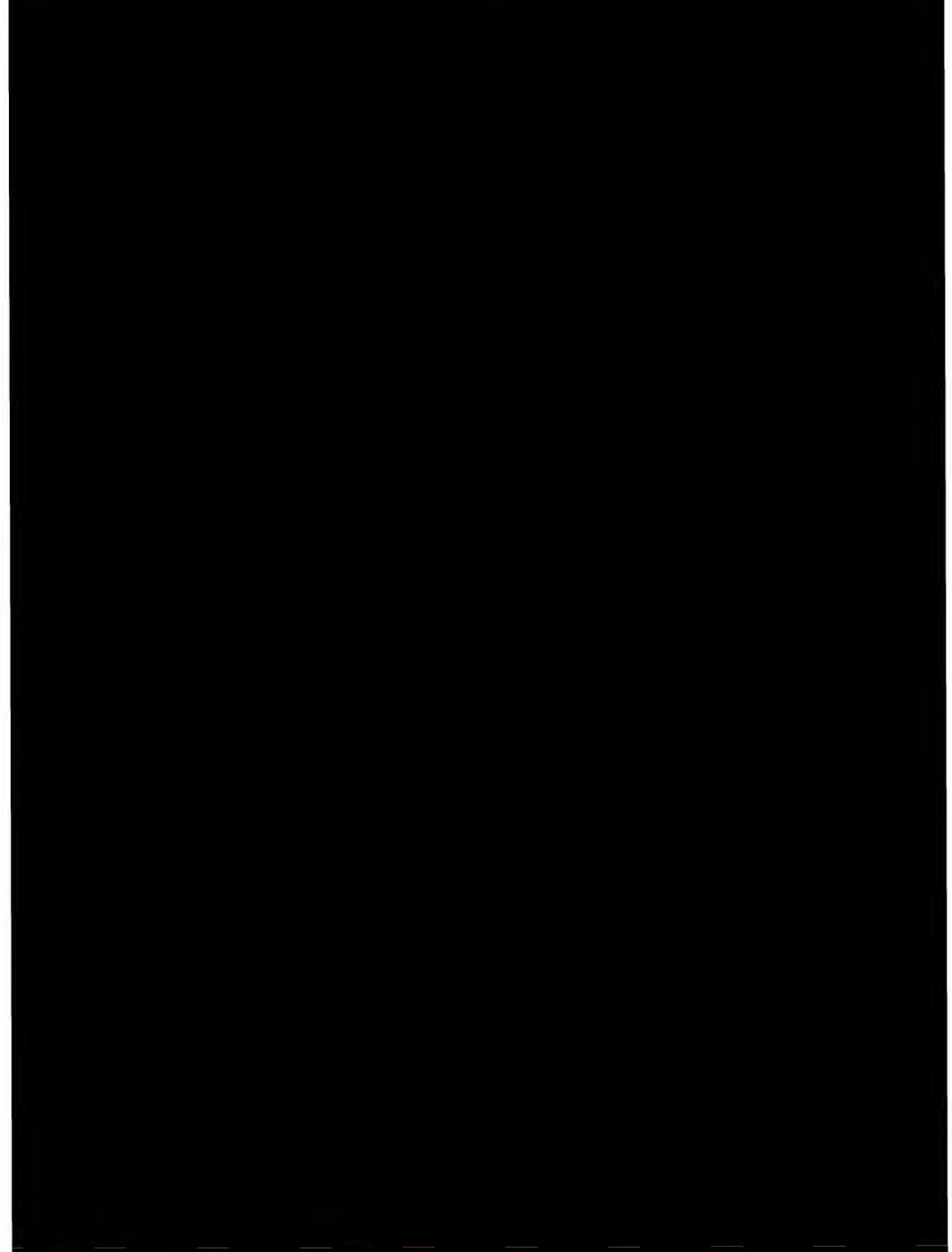


Figure 1.7. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

- |  |  |   |  |
|--|--|---|--|
| a. 05-<br>(b) (3) Cultural Resources<br>-3         | b. 05-<br>(b) (3) Cultural Resources<br>-10E-2N-L3 | c. 05-<br>(b) (3) Cultural Resources<br>-7        | d. 05-<br>(b) (3) Cultural Resources<br>-6     |
| e. 05-<br>(b) (3) Cultural Resources<br>-21W-1N-L8 | f. 06-<br>(b) (3) Cultural Resources<br>-4-A-4     | g. 06-<br>(b) (3) Cultural Resources<br>-3-D-7    | h. 06-<br>(b) (3) Cultural Resources<br>-2-D-2 |
| i. 06-<br>(b) (3) Cultural Resources<br>-2-B-4-1   | j. 06-<br>(b) (3) Cultural Resources<br>-3-D-7-2   | k. 05-<br>(b) (3) Cultural Resources<br>-0W-2N-L4 | l. 06-<br>(b) (3) Cultural Resources<br>-3-C-7 |
| m. 06-<br>(b) (3) Cultural Resources<br>-2-A-2     | n. 06-<br>(b) (3) Cultural Resources<br>-2-B-4-2   | o. 06-<br>(b) (3) Cultural Resources<br>-4-A-3    | p. 06-<br>(b) (3) Cultural Resources<br>-3-C-6 |
| q. 05-<br>(b) (3) Cultural Resources<br>-4         | r. 05-<br>(b) (3) Cultural Resources<br>-1         | s. 05-<br>(b) (3) Cultural Resources<br>-5        | t. 06-<br>(b) (3) Cultural Resources<br>-4-1B  |
| u. 06-<br>(b) (3) Cultural Resources<br>-4-A-3     |  |   |  |

Table 1.2. Redmond

Cat. #	L.	W.	Th.	Wt.	Src.	Hyd.	Remarks
05-04	33.0*	18.5*	4.9	2.8*(cut)		2.3	
05-05	42.0*	19.5	6.5	6.1*(cut)		4.9	
05-06	13.5*	14.3	4.3	0.9*(cut)		2.6	
05-07	32.4*	13.9*	2.9	0.9*(cut)		1.9	
05-10W/2N-4	32.3	20.2	4.5			-	
05-10E/2N-3	16.4	10.0	2.6	0.4		-	
05-21W/1N-8	27.2*	14.1	3.0	1.25		-	
05-1-C-2	12.7*	22.5*	5.7*	1.7*(cut)		1.5	
06-2-A-2	30.3*	25.0	3.9	2.3*(cut)		1.9	
06-2-B-4(2)	35.8	14.8	3.9	1.8*(cut)		2.0	
06-2-B-4(1)	41.1*	15.0	4.4	2.17		-	
06-2-D-2	30.6	18.2	4.8	2.2 (cut)		NA	
06-3-C-6	17.5*	16.1	4.0	1.3*(cut)		2.0	
06-3-C-7	48.2*	16.5	5.5	5.5*(cut)		NA	
06-3-D-7	40.6	16.6	4.1	1.7 (cut)		2.6	
06-3-D-7	40.0	16.9	4.8	2.37		-	
06-4-A-3	13.1*	15.2*	4.8*	0.8*(cut)		2.6	
06-4-A-3(2)	40.0*	17.8	4.6	2.6*(cut)		NA	
06-4-A-4	36.2*	22.3*	5.9	3.8*(cut)		2.8	

## Notes

\* = fragment

## Notes

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

The stratigraphic integrity of the Unit 2 and 3 excavations, coupled with the obsidian sourcing and hydration information and the radiocarbon date, allows a glimpse of at least one component of the cave that is not available, to our knowledge anywhere else within the cave. Multiple 50x50 cm and 1x1 m excavations across the broad expanse of the cave interior in 2005 did not produce anything that was comparable to the 2006 effort. The devastation is both remarkable in its intensity and tragic, but it does clear the way for future use of for public interpretive purposes, with little concern that significant resources will be impacted. That time came and went decades ago.

Table 1.3. Redmond

Cat. #	L.	W	Th.	Wt.		Src.	Hyd	Remarks
05-1	29.0*	21.2*	4.4*	2.8*(cut)			2.6	
05-2	29.6*	31.0	4.7	6.2*(cut)			2.3	
05-3	18.7	11.6	2.5	0.9*(cut)			1.2	
05-ISO-1	20.1	12.4	3.7	0.8*(cut)			2.1	
05-1-C-3	15.6*	18.6*	5.2*	1.1*(cut)			5.8	
05-F1-4	20.8*	18.4*	5.1*	1.7*(cut)			4.8	
05-F1-4(2)	38.2*	26.9*	5.9*	7.2*(cut)			2.1	
05-F1-4(3)	22.8*	26.9*	6.8*	4.0*(cut)			4.8	
05-SW/10N-2	7.7*	5.9*	1.4*	0.1*			-	
05-20W/ON-3	26.1*	10.6*	5.3*	1.1*(cut)			3.0	
05-20W/1N-5	11.3*	5.6*	2.7*	0.1*				
05-20W/1N-7	38.7*	26.0*	4.6*	3.1 (cut)			3.8	
05-10E/6S-1	14.4*	15.8*	4.6*	0.7			-	
05-6-C-5	60.6	22.9	5.0	4.7*			-	
06-1-4	13.1*	12.2*	4.8*	0.9*(cut)			2.1	
06-2-A-2	13.8*	12.7*	2.1*	0.5*			-	
06-2-A-4	42.4	40.3	13.4	21.2 (cut)			2.0	
06-2-B-1-1	35.8*	14.4*	6.8*	3.3*(cut)			2.4	
06-2-B-3	20.4*	4.7*	2.9*	0.2*			-	
06-2-B-4	34.0	19.2	5.0	3.3 (cut)			2.7	
06-2-B-5B	18.8*	25.9*	6.2*	2.8*(cut)			1.2	
06-2-B-6B							4.4	
06-2-C-2B	13.5*	8.8*	2.6*	0.3*(cut)			1.2	
06-2-C-4B	25.1*	31.6	8.9	7.3*(cut)			4.2	
06-2-C-6	15.0*	11.4*	2.9*	0.5*(cut)			2.7	
06-2-C-6(2)	11.8*	9.7*	2.5*	0.3*(cut)			2.6	
06-2-D-6-8	13.7*	13.0*	5.0*	0.9*(cut)				
06-3-C-4B	29.8*	28.0*	7.4	5.4*(cut)			1.4	
06-3-C-6B	81.7*	40.2*	13.2	42.3*(cut)			2.5	
06-3-D-7	28.7*	32.5	8.1	9.6			-	
06-3-D-7	32.8	21.1	6.5	3.9*			-	
06-3-D-7B	28.7*	28.8*	6.4	5.9*(cut)			2.4	
06-3-D-9	6.4*	4.0*	1.9*	0.1*(cut)			1.9	
06-4-1B	24.0*	26.1*	8.3*	5.0*(cut)			2.5	
06-4-3B	33.6*	12.5*	5.0*	1.7*(cut)			2.5	
06-4-5	14.4*	28.4*	10.1*	3.6				

## Notes

\* = fragment

## Notes:

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure 1.8. (b) (3) Cultural Resources collected from (b) (3) Cultural Resources shown actual size:

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

- |                     |                     |               |                |
|---------------------|---------------------|---------------|----------------|
| a. 05-15E/4N-1      | b. 05-5(36E3N)-C-1a | c. 05-20E4N-2 | d. 05-25E3S-1a |
| e. 05-5(36E3N)-C-1b | f. 05-2-wallfall    | g. 05-25E5N-3 | h. 05-25E3S-3  |
| i. 06-25E3S-1b      | j. 05-9E6S-4        | k. 05-10E5N-5 | l. 05-25E5N-2  |

### Cave

A total of (b) (3) Cultural Resources was recovered during the work in (b) (3) Cultural Resources (Figure 1.8, and Table 1.4). They included (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were collected during the 2005 excavations. The majority of the (b) (3) Cultural Resources (n=7) came from a specific zone within the cave, ranging between 25 to 36 meters east of the datum. This corresponds to a transitional area where natural light gives way to darkness, roof fall boulders are abundant, and woodrat feces are highly concentrated. There is not enough evidence to strongly suggest that the collection behavior of woodrats is responsible for this distribution, but it would be remiss to not mention the possibility. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were collected from Probe 25E/3S, a 50x50 dug in 2005.

Table 1.4. Redmond Caves (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Cat. #	L	W	Th	Wt.	(b) (3) Cultural Resources	Remarks
05-9E/6S-F1-4	3.4	3.4	1.6	0.02	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	
05-10E/5N-5	3.4	3.4	0.6	0.0		
05-15E/4N-1	7.5	7.0	1.0	0.09		
05-20E/4N-2	7.3	7.1	1.2	0.11		
05-25E/3S-1	7.9	7.2	0.8	0.07		
05-25E/3S-1	6.0	5.8	0.7	0.03		
05-25E/3S-3	11.3	6.2	1.2	0.14		
05-25E/5N-3	8.5	8.2	0.9	0.10		
05-25E/5N-2	2.8	3.0	0.4	0.01		
05-36E/3N-C-1	5.4	4.9	1.0	0.03		
05-36E/3N-C-1	5.3	5.1	0.8	0.02		
06-TU2-fill	6.1	5.0	0.7	0.03		

Table 1.5. Redmond

Cal. #	L.	W.	Th.	Wt.	Mat.	Src.	Hyd.	Remarks
05-10E/0N-2	66.4	55.8	13.2	69.1	(b) (3) Cultural Resources	(b) (3) Cultural Resources	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
05-10E/SN-7	41.7	33.2	6.0	6.2			2.5	
05-10E/6S-2	27.0	13.8	4.0	1.5			-	
05-20E/0N-2	36.6	22.2	5.2	4.3			NA	
05-10W/1N-2	34.5	24.6	9.8	6.0(cut)			2.3	
05-5-D-1	34.0	25.3	9.5	6.9			2.3	
06-2-A-2-2	40.2	29.8	4.3	3.2(cut)			2.4	
06-2-A-5	55.0	32.5	18.0	21.9			-	
06-2-A-5-1	26.1	21.2	5.9	4.3			2.5	
06-2-A-5F	13.9	13.6	2.1	0.5			-	
06-2-B-4-2	37.3	12.5	10.7	4.7			2.5	
06-2-B-5-2	26.2	21.0	4.5	1.4			2.4	
06-2-C-3	27.4	20.8	4.5	2.9			-	
06-2-D-4-1	40.4	17.4	3.8	2.7			2.2	
06-3-C-7-2	46.2	43.1	5.4	10.4			2.4	
06-4-3	59.5	35.9	14.1	26.69			-	

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

*Summary Tables*

The following tables provide summaries of the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) that were collected during the 2005 and 2006 seasons, with estimates from the field records substituted where complete tallies are not available at this time. Mass analysis of the (b) (3) Cultural Resources was also carried out by students (b) (6) Personal Privacy in 2005 and (b) (6) Personal Privacy in 2007, and both of these analyses will be included in a final report. (b) (3) Cultural Resources analysis has not been carried out to date due to the complexity of the assemblage, composed of high quantities of naturally deposited (and highly identifiable) specimens mixed with small quantities of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (based on thermal alteration), and no budget for analysis.

Table 1.6. 2005 Redmond Caves (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) excavation units.

Unit (b) (3) Cultural Resources - 1x1 meter units								
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)							
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								

Table 1.6 (continued). 2005 Redmond Caves (b) (3) Cultural Resources excavation units.

	3N/30W	1N/30W	0N/30W	Unit <span style="background-color: black; color: red;">(b) (3) Cultural Resources</span>	50x50 cm units	3N/25W	0N/25W	3S/25W	3N/20W	0N/20W	5S/20W	10S/20W
<u>Level</u>	<b>(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)</b>											
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

	3N/15W	0N/15W	5S/15W	Unit <span style="background-color: black; color: red;">(b) (3) Cultural Resources</span>	50x50 cm units	10S/15W	1N/10W	0N/10W	5S/10W	2N/0W	1S/0W	2.4S/0W
<u>Level</u>	<b>(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)</b>											
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

	7N/5E	3N/5E	3S/5E	Unit <span style="background-color: black; color: red;">(b) (3) Cultural Resources</span>	50x50 cm units	5N/10E	0N/10E	6S/10E	4N/14.5E	4N/15E	0N/15E	4.5S/13E
<u>Level</u>	<b>(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)</b>											
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11'												
12												

Table 1.6 (continued). 2005 Redmond Caves (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) excavation units.

Level	Unit (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) 50x50 cm units									
	5S/15E	4N/20E	0N/20E	4S/20E	7N/25E	5N/25E	0N/26E	3S/25E	7N/30E	5N/30E
1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)									
2										
3										
4										
5										
6										
7										
8										
9										
10										

Level	Unit (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) 50x50 cm units							
	0N/25.9E	3S/30E	3N/35E	0N/34E	0N/35E	4S/35E	0N/40E	4.5S/40E
1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)							
2								
3								
4								
5								
6								
7								
8								
9								
10								

Table 1.7. 2006 Redmond Caves (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Level	Unit (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)							
	1A	1B	2A	2B	2C	2D	3C	3D
1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)							
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
total								

Table 1.8. 2005 Redmond Caves (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
	1x1 m excavation units							
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)							
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								

	50x50 cm units									
	3N/30W	1N/30W	0N/30W	3N/25W	0N/25W	3S/25W	3N/20W	0N/20W	5S/20W	10S/20W
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)									
1										
2										
3										
4										
5										
6										
7										
8										
9										

	Unit <span style="background-color: black; color: red;">(b) (3) (C)</span> 50x50 cm units									
	3N/15W	0N/15W	5S/15W	10S/15W	1N/10W	0N/10W	5S/10W	2.4S/0W	2N/0W	1S/0W
<u>Level</u>	<div>(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)</div>									
1										
2										
3										
4										
5										
6										
7										

Unit <span style="background-color: black; color: red;">50x50</span> 50x50 cm units									
7N/5E	3N/5E	3S/5E	5N/10E	0N/10E	6S/10E	4N/14.5E	4N/15E	0N/15E	4.5S/13E

Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)									
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

Table 1.8 (continued). 2005 Redmond Caves (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) excavation units.

	5S/15E	4N/20E	0N/20E	Unit (b) (3) 4S/20E	50x50 cm units	7N/25E	5N/25E	0N/26E	3S/25E	7N/30E	5N/30E
<b>Level</b>											
1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)										
2											
3											
4											
5											
6											
7											
8											
9											
10											
	0N/29.5E	3S/30E	3N/35E	Unit (b) (3) 0N/34E	50x50 cm units	0N/35E	4S/35E	0N/40E	4.5S/40E	9S/60E	12S/57E
<b>Level</b>											
1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)										
2											
3											
4											
5											
6											
7											
8											
9											
10											

Table 1.9. 2006 Redmond Caves (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

	1A	1B	2A	2B	Unit (b) (3) 2C	2D	3C	3D	4A
<b>Level</b>									
1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)								
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									



### *Summary and Management Considerations*

(b) (3) Cultural Resources collectors have caused tremendous damage to the (b) (3) Cultural Resources deposits in (b) (3) Cultural Resources. It would take a sustained, large scale effort to locate other pockets of intact (b) (3) Cultural Resources material within the cave and it seems almost certain that none will be found near the surface. Such an effort would provide, at best, a patchy incomplete perspective on (b) (3) Cultural Resources within the cave, limited to a glimpse here and there of the past. (b) (3) Cultural Resources recovered within (b) (3) Cultural Resources suggest that most prehistoric use occurred within the last 6,000 years, as made evident by the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) and a (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) but there are also (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) and a few hydration measurements that may indicate earlier use.

The presence of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) indicate that (b) (3) Cultural Resources was used as a frequent stopover for people conducting (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) not an uncommon occurrence by any means. The dominance of geochemical sources from the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) suggest that much of the traffic was coming from the south and west, moving northward to (b) (3) Cultural Resources and points beyond. (b) (3) Cultural Resources made from (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were found within (b) (3) Cultural Resources indicating that people utilizing the cave had access to these items either through direct or indirect trade.

In terms of public accessibility, the cave would be an ideal choice for interpretive purposes, with a high ceiling and a natural ramp leading from the outside to the interior. The high degree of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) disturbance to the upper cave deposits is an important factor, because most of the modifications for park visitors such as stairways, ramps, or walkways would occur near the surface. Our excavations in 2005 and 2006 document the degree of damage that has occurred, illuminating the tragic consequences of (b) (3) Cultural Resources collecting while at the same time paving a clear path for use of the cave in public interpretive purposes.



## Redmond Cave

(b) (3) Cultural Resources

(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)

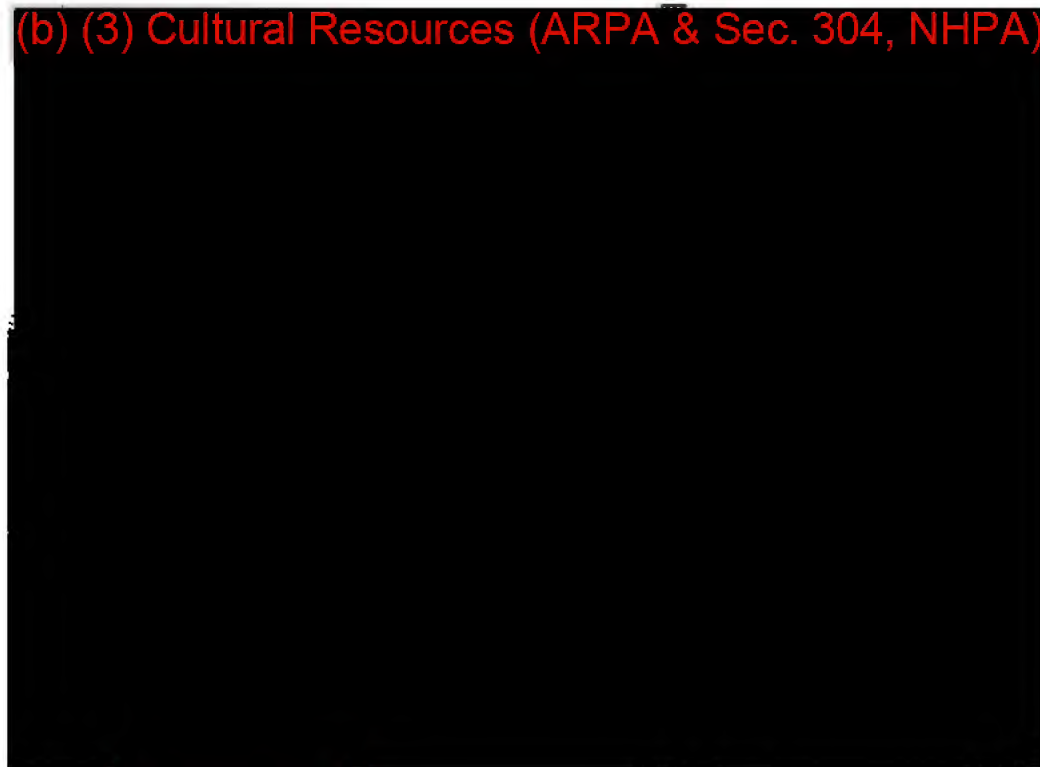


Figure 2.1. (b) (3) Cultural Resources (ARPA & Sec. 304, NHPA) Note the low profile and mounded sediments in front of entrance.

## Excavation and Summary

(b) (3) Cultural Resources

(b) (3) Cultural Resources offers a sliver of an entrance into a sediment-filled lava tube, which faces a low basalt rim “courtyard” formed by roof collapse extending to the south and west. An explorer can crawl about two body-lengths into the tube before it pinches off due to a steep downward angle and infilling by loose sand and volcanic ash exceeding the angle of repose. Much of the room within the cave interior has been created from fill removal by cave explorers or (b) (3) Cultural Resources collectors (squares of ¼” mesh hardware cloth outside of the cave attest to the latter), and a berm of the removed sediments has accumulated in front of the entrance. Although there was little obvious evidence of (b) (3) Cultural Resources materials on most surfaces, small fragments of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were visible in and mound tailings adjacent to the berm. It was clear that an (b) (3) Cultural Resources accumulation was present at the cave, possibly protected by the mound of fill removed from the cave.

The cave entrance is approximately one meter high by three meters wide, and the nature of the already removed fill suggested that efforts to work inside the cave and achieve sufficient depth to reach (b) (3) Cultural Resources deposits would be futile as well as extremely difficult. We were encouraged by the extent of the old lava tube remnants; the low wall of basalt marking the old walls of the cave that extended over 45 meters to the east had collapsed westward over millennia and a large amount of sediment had blown into the basin over time. It was possible that a large excavation unit would allow enough depth to reach (b) (3) Cultural Resources surfaces associated with an old cave entrance. To achieve that goal, a 1x2 meter unit was established in the primary berm accumulation, extending eastward away from the cave entrance. The excavation of the 1x2 was carried out in 10 cm increments. (b) (6) Personal Privacy carried out much of the excavation with assistance from other field school members.

(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)

Surface sediments consist of brown silty sand and volcanic ash with unsorted angular basalt gravels. Large boulders flank the cave opening, pieces from the continually collapsing lava tube. Vegetation around [REDACTED] includes juniper, sagebrush, rabbitbrush, bitterbrush, bunchgrasses and cheatgrass.

Excavation at [REDACTED] can be summarized as full excavation of Unit 1 utilizing trowels and shovels to a depth of 1.5 meters, followed by auger excavation in both quads A and B to depths of 2.25 and 5 meters, respectively (Figures 2.2 and 2.3). A third auger probe was dug at the cave entrance, which reached a depth of 2.4 meters before terminating on rock. In Unit 1, loose re-deposited fill from the cave was mixed with recent [REDACTED] to a depth of ca. 70 cm, followed by stratified eolian silty sand and volcanic ash deposits containing [REDACTED] and small amounts of [REDACTED] (Table 2.1). [REDACTED] concentrations began to increase at ca. 1.1 meter. In Quad A, a basalt [REDACTED] was collected in level 8, an obsidian [REDACTED] was recovered at 115 cm, an [REDACTED] in level 13 and [REDACTED] in level 14. [REDACTED] was noted in the same level as the obsidian [REDACTED]

Figure 2.2. [REDACTED] Unit 1 with [REDACTED] in background

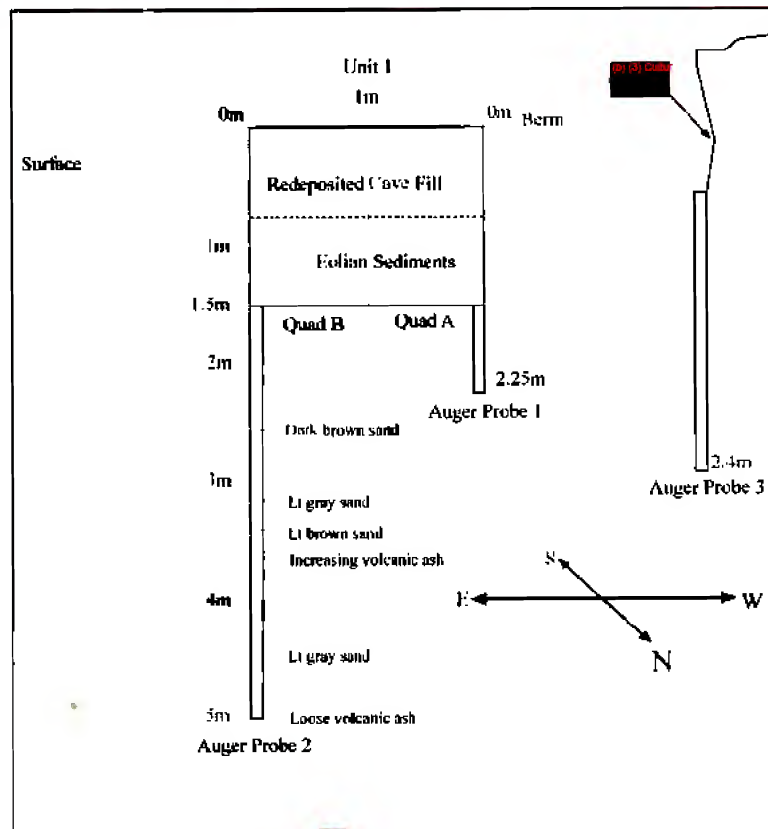


Figure 2.3. Schematic drawing of Cave [REDACTED] excavation depths and primary sediment landmarks.

Table 2.1. Redmond Caves: 2005 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) Unit 1 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) Counts by level.

Level	Quad A	Quad B
	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	
1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	
2		
3		
4		
5		
6		
7		
	-----transition from cave backdirt to eolian sediment-----	
8	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	
9		
10		
11		
12		
13		
14		

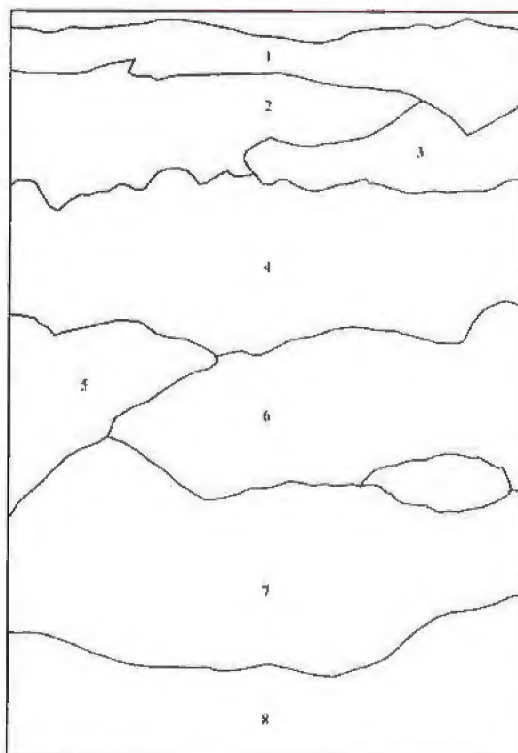
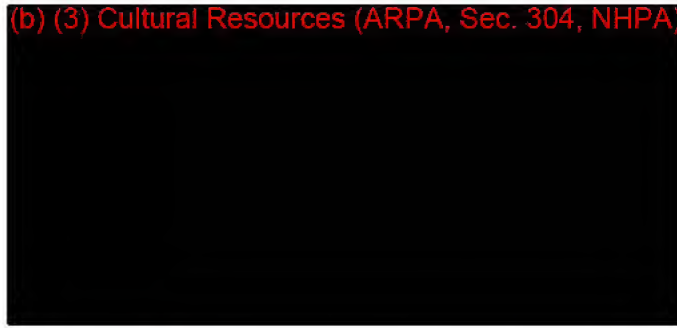


Figure 2.4. Sediment Profile: Surface to 1.5 meters

- 1.) Sod zone, loose eolian and redeposited sands and volcanic ash
- 2.) Ashy silts, weathered basalt, fine feldspar crystals 10yr 5/5 yellow brown
- 3.) Silty sands and 20% ash, small angular basalt pebbles 10yr 5/3 brown
- 4.) 30% ash, silty sand, some quartz crystals, 10yr 4/3 dark brown
- 5.) 40% ash, rest silty sands and angular to subangular basalt gravels, quartz crystals, 10yr 5/3 brown
- 6.) 50% ash, silty sands with small angular basalt gravels, 10yr 6/3 pale brown
- 7.) 15% ash, sand, very little gravel (<2%), 10yr 5/3 brown
- 8.) 3% ash in compact sand, 10yr 5/4 yellow brown

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

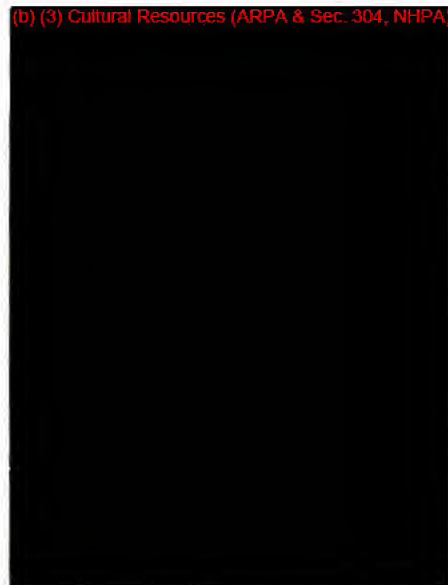


A thin layer of gravels and cobbles was encountered from 120 to 140 cm, giving way to sands and silts again below. Two pieces of [REDACTED] were collected in level 12 of Quad A (120+ cm).

[REDACTED] is the most intriguing of the five lava tubes on the parcel because the entrance collapsed early, in relation to the other caves, and there are clearly deeply buried [REDACTED] materials present as evidenced by (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) in the anthill near the entrance as well as [REDACTED] recovered from our excavations. The deposits are laden with [REDACTED] to a depth of 40 cm (level 4), followed by an increase in [REDACTED] particularly [REDACTED] at 70-80 cm (level 8). [REDACTED] is present through all levels, but most of the [REDACTED] is natural cave deposition. The transition seems to coincide with the development of Stratum 6 (Figure 2.4). Strata 1-5 are re-deposited sediments. [REDACTED] material is present to the bottom of the unit, but not in the auger probes below that level. This is not particularly surprising, since the bore on the auger is narrow and [REDACTED] materials are dispersed. All of the [REDACTED] were collected in Quad A, and the deepest auger probe occurred in Quad B. (b) (6) Personal Privacy noted an unusual concentration of angular basalt cobbles in the northwest corner of Quad A, level 12, where [REDACTED] was also collected. The cobbles had largely dissipated by the next level.

[REDACTED] offers considerable potential for future research. Although deep sediments cover and protect the old natural and [REDACTED] surfaces, the locality should be managed with caution. Passage of heavy equipment should be avoided entirely in the vicinity of the cave entrance and the collapsed entryway to the east. Digging has occurred in the cave, the northern edge of the collapsed entrance has been dug out, and a basalt seam along the access road to the east has also been dug into over the course of four years (Figure 2.6). The cave is relatively secluded and considerable damage could occur there before anyone might notice. We recommend that site stewardship be implemented for the entire parcel, with special attention given to the [REDACTED] location.

(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)



(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)

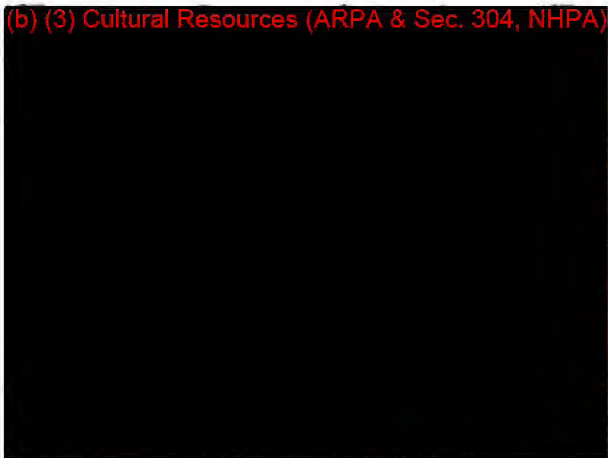


Figure 2.6. Excavated basalt seam near [REDACTED] in 2005 (above) and 2008 (right).

## Redmond Cave

(b) (3) Cultural Resources

(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)

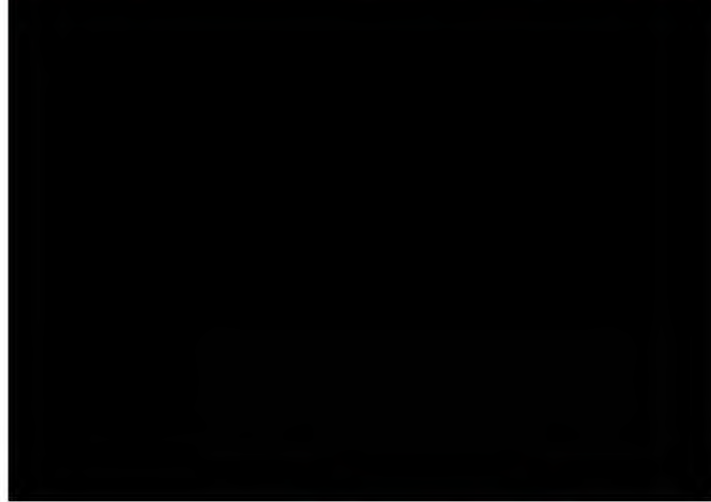


Figure 2.1.

(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)

The main entrance to (b) (3) Cultural Resources (Figures #.1 and #.2) is approximately 80 m southeast of (b) (3) Cultural Resources but a small opening adjacent to the (b) (3) Cultural Resources entrance offers a secondary passage while revealing that the two lava tubes are nearly parallel to each other for some distance. The main entrance is low and it is necessary to crouch down to enter. Once inside, there is a large chamber (ca. 20 x 40 m) with ample clearance to stand up and move freely. Beyond this chamber, the lava tube narrows and extends in a northwesterly direction toward the entrance of (b) (3) Cultural Resources and a side channel runs approximately 50 m to the west. The area beyond the chamber is cloaked in darkness and accessible only with the use of lanterns. Within the chamber, one portion (on the northeast side near the back) has been completely dug out by (b) (3) Cultural Resources

(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)



Figure #.2. (b) (3) Cultural Resources entrance is to the left. The boulders removed from the entrance are piled just right of center.



## (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

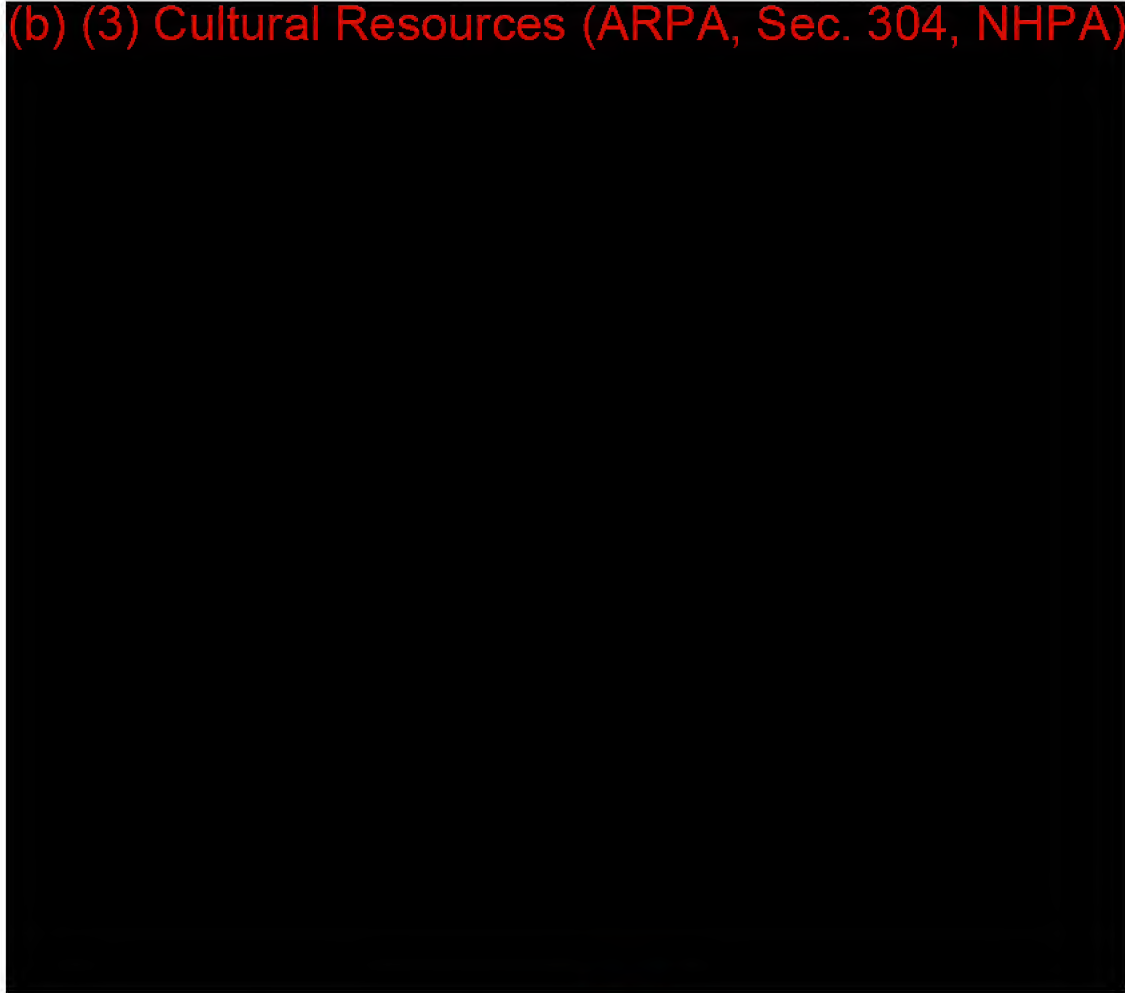


Figure #3. Sketch map of the (b) (3) Cultural Resources excavation units.

collectors and a substantial mound of backdirt covers the floor to the south, towards the entrance (Figure #.3). The main entrance was apparently closed or constricted at one time and a large pile of basalt boulders ca. 5-10 meters from the basalt formation marks the event (Figure #.2). According to (b) (3) Personal Privacy (Personal communication 2005) the entrance was completely silted in until the 1930s when county workers dug it out using heavy equipment. This report has not been corroborated through newspaper reports or other background research, but it does fit well with the physical evidence. Runoff from precipitation periodically cuts channels into the floor deposits and accumulates under the surface. During the 2005 excavations in August, damp sediments were present in both (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (Personal communication 2005) reported being in (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) once when the water was almost knee-deep. Repeated wetting and drying of the cave deposits would have adverse affects on perishable materials such as (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) and other botanical remains.

Although Helzer and her students excavated a 1x1 outside of the entrance in 2004 (Helzer et al. 2004), the first round of excavation work inside the cave began in 2005 with a series of ten auger probes placed diagonally from the north side near the cave entrance back into the southern interior. The probes were spaced at two meter intervals and dug with a 2 ¼ inch geologic auger. The work was undertaken to determine the potential for deep, possibly intact deposits and perishable materials, since the origin of Heizer's (1941) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) was still unresolved. All but one probe produced (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) an impressive result that highlighted the density of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) material, considering the narrow gauge of the auger. Probes

ranged in depth from 20 to 160 cm and most of the (b) (5) Cultural Resources material was collected in the upper 50 cm (Table #.1). Probe 0N, 2W had two distinct (b) (5) Cultural Resources deposits, one between 0-50 cm and another from 130-160 cm below the surface. (b) (5) Cultural Resources were also collected (Table #.2), but so much (b) (5) Cultural Resources deposition has occurred over time that (b) (5) Cultural Resources remains are not as clear of an indicator in this circumstance as (b) (5) Cultural Resources. It is true that the vertical distribution of (b) (5) Cultural Resources remains in 0N, 2W mirrors the recovery of (b) (5) Cultural Resources.

Excavations in 2006 included 19 50x50 cm test pits (TP1 through 19). TP 1 through 8 were placed at five meter intervals. The recovery of high quantities of (b) (5) Cultural Resources material in TP 2 and 5 prompted excavation of three (9,10, and 12) at 2.5 m intervals surrounding TP2 to the south, east, and north respectively. The placement of probes at five meter intervals was then continued for 13-15 and 17-19. TP11 was excavated at the cave entrance, and 16 was placed to evaluate sediments underlying a substantial pile of looter's backdirt after the fill was leveled to the approximate cave surface. Several test pits were expanded into larger units after excavation revealed high concentrations of (b) (5) Cultural Resources (ARPA, Sec. 304, NHPA) of particular interest. These included TU1 (expanded on TP11) TU2 (an expansion of TP12 into a 1x2 m unit), TU3 (a 2x2 m unit with TP14 in the northwest corner) and TP4 (an expansion of TP17). The location of TU2 also corresponds to the location where auger probe 0N, 6W encountered two distinct concentrations of (b) (5) Cultural Resources.

Table #.1. Redmond (b) (5) Cultural Resources (ARPA, Sec. 304, NHPA) from 2005 auger probes.

Probe	Depth max. (cm)	(b) (5) Cultural Resources Count	Depth of recovery (cm)
0N, 0W	30	(b) (5) Cultural Resources n=6	0-30
0N, 2W	150	(b) (5) Cultural Resources n=9	0-50 (6), 130-160 (3)
0N, 4W	70	(b) (5) Cultural Resources n=3	20-70
0N, 6W	160	(b) (5) Cultural Resources n=3	0-90
0N, 8W	60	(b) (5) Cultural Resources n=5	0-50
0N, 10W	40	(b) (5) Cultural Resources n=3	0-40
0N, 12W	70	(b) (5) Cultural Resources n=16	0-70
0N, 14W	20	(b) (5) Cultural Resources n=2	0-20
0N, 16W	60	(b) (5) Cultural Resources	-
0N, 18W	20	(b) (5) Cultural Resources n=1	0-10



Table #.2. 2005 Redmond (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) from 2005 auger probes.

	0N/0W	0N/2W	0N/4W	0N/6W	Unit (b) (3) Cultural Resources	0N/8W	0N/10W	0N/12W	0N/14W	0N/16W	0N/18W
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)										
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											

Table #.3. (b) (3) Cultural Resources materials recovered in 2006.

					Unit (b) (3) Cultural Resources						
	1	2	3	4	5	6	7	8	9	10	11
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)										
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12-38											

					Unit (b) (3) Cultural Resources				
	12	13	14	15	16	17	18	19	
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)								
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

Unit (b) (3) Cultural

TU1 TU2A TU2B TU3A TU3(B) TU3C TU3D TU4

Level	
1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	

Table #.4. 2006 (b) (3) Cultural remains.

	1	2	3	4	Unit 5 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	6	7	8	9	10	11
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)										
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13-38											

	12	13	14	15	Unit 16 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	17	18	19
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)							
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

	TU1	TU2A	TU2B	TU3A	Unit TU3B(TU3)	TU3C	TU3D	TU4
Level								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								

### *Radiocarbon Dates*

The collection of material suitable for radiocarbon dating proved to be more difficult than originally expected. While plenty of (b) (3) Cultural Resources and other organic material was available within the cave, little could be attributed to undisturbed deposits. Despite outward appearances (particularly with regard to seeds), some material proved unsuitable for dating in part because of deterioration from repeated wetting and drying episodes. All of the samples were submitted for accelerator mass spectrometry (AMS) dating.

A sample consisting of five wada (*Sucada depressa*) seeds collected in Unit 3, Feature 1, was sent to Beta Analytic, Inc. following botanical analysis by Dexter (see below). The seeds produced an insufficient quantity of carbon because they were either uncharred or only partially heated (b) (3) Cultural Resources personal communication 2008). At the request of Beta Analytic, the initial sample was supplemented with the remaining eight seeds, but still proved too small for dating.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) found in Unit 3, Quad C, level 9 were also submitted. The sample collected from exposures of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) in the cut end, from crevices in a crack along one side, and from (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) on the exterior. Communication with Beta Analytic (b) (3) Cultural Resources personal communication 2008) revealed that despite its appearance, the (b) (3) Cultural Resources sample was too decayed to provide a sample adequate for dating purposes. Although an adequate amount of (b) (3) Cultural Resources was extracted, the C13/12 carbon ratio was more depleted than normal. This depletion could have been the result of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). Of these examples, the first and the last are the most likely. An additional sample was requested which would have resulted in cosmetic damage to the (b) (3) Cultural Resources to the effort was abandoned.

Finally, a fragment of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources personal communication 2008) also collected from Unit 3 (Quad D, level 9) was submitted for dating (Table #.4). A small piece of the 3 cm-long object was clipped for this purpose, yielding a conventional date of 560±40 BP, with two calibrated intercepts between 650-580 BP and 570-520 BP. (b) (3) Cultural Resources is an emergent wetland plant that would not have been found near the site. Helzer (2001:169) notes that (b) (3) Cultural Resources was a primary food resource at the Bergen site in the Fort Rock Valley and probably used as exterior matting for the shelter and for sleeping mats.

A (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) originally collected by Helzer was AMS dated by Helzer (2003:43), producing a conventional date of 1820±40 BP with two calibrated intercepts between 1860-1690 and 1660-1630 BP. We believe the (b) (3) Cultural Resources was recovered from (b) (3) Cultural Resources because of the presence of (b) (3) Cultural Resources and the fact that no

perishable material was found in [REDACTED] despite extensive archaeological investigations. Heizer identified the find location as [REDACTED] but there is no clear documentation of how he numbered the caves. At the time he was working Redmond Caves in 1941, [REDACTED] had not been opened yet, and both [REDACTED] were likely too shallow to be of interest.

Table #.5. Redmond Caves radiocarbon dates.

AMS Sample #	Beta #	Measured Age	Conventional Age	Calib. BP Age (2 sigma)	Material	Provenience
173-3-3-D-9	242950	540 ± 40 BP	560 ± 40 BP	650 - 580 570 - 520	[REDACTED]	[REDACTED]
1-11921	177958	1820 ± 40 BP	1820 ± 40 BP	1860 - 1690 1660 - 1630	[REDACTED]	[REDACTED]

## Test Units

The nineteen test pits excavated in 2006 illuminated two important characteristics of the cave deposits. The first is that deeply buried deposits are still undisturbed in some areas. Second, that there are two components, an upper and a lower, in some of the deeper accumulations (Table 3). Four test units ranging in size from 1x1 m to 2x2 m were excavated to explore these characteristics and to target locations where particularly unique artifacts were recovered. They are described in turn below.

### Test Unit 1

TU1 was an expansion on TP3, a 50x50 dug at the east side of the entrance and included as the southeast quadrant of the test unit. TP3 produced [REDACTED] in level 6 (06-C3-P3-6) and [REDACTED] accumulated in what appeared to be two distinct components. The upper component extended from the surface to 50 cm, and the second component from 90-110 cm.

In TU1, [REDACTED] counts also exhibited binomial distributions, with a peak at level 5 and another at level 9. [REDACTED] were collected in TU1, [REDACTED] in level 5 (06-C3-1-5) and [REDACTED] in level 7 (06-C3-1-7-S2). Both of these [REDACTED] were made of obsidian. [REDACTED] included [REDACTED] in level 4, [REDACTED] in level 3, and a [REDACTED] in level 8. A [REDACTED] was found in level 1, [REDACTED] in level 2. [REDACTED] (n=2) were collected in levels 4 and 8. [REDACTED] was collected in level 9. [REDACTED] peaked in levels 7 and 9. Judging by this brief inventory, there appears to be some consistency to the split distribution of [REDACTED] with [REDACTED] separated by at least one level and often more,

**(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)**

**(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)**

Heizer collected a [REDACTED] from the caves in 1941 and a few [REDACTED] were found in 2005 and 2006, otherwise, [REDACTED] in general has a very limited representation at the caves and no other [REDACTED] were found.



(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure #.3. [redacted] in situ and following removal from the unit.

### Test Unit 2

TU2 was a 1x2 m expansion of TP12 initiated to explore deep, rich, and possibly multicomponent deposits. TP12 was positioned in the northwest corner of TU2. Quad A, with B as the other excavated quadrant, (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (Figure #.4.) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) Both (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) accumulations suggested two peaks in TP12, one at level 3 and another near level 6.

In TU2, Quad A reached a depth of 140 cm and Quad B was terminated at 180 cm due to safety concerns. The unit was excavated at the base of the backdirt pile to the northeast (between the backdirt pile and the entrance). Quad A of TU2 exhibited two peaks in (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (at levels 4 and 10) and Quad B had four (at levels 2,4,9, and 15). The (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) yielded similar results with two peaks in Quad A at levels 4 and 9, and four peaks in Quad B at levels 2,4,8, and 13. The correlation between (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) suggests that there were consistent (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) surfaces in (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) that were undisturbed.

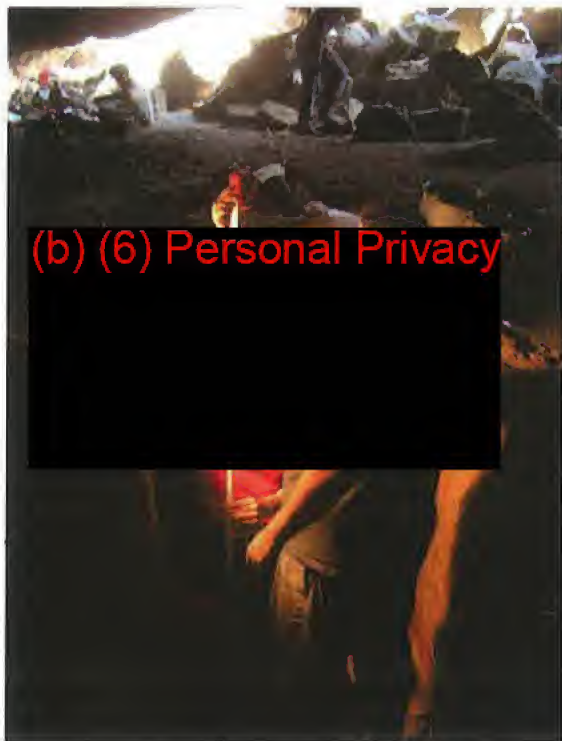


Figure #.5. Excavators working in TU2, with the cave entrance in the background. The seated figure is working at TU1.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure #.4. [redacted] from TU2. Quad B, level 8, and [redacted] from TP12, level 12.

## (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Sediments in TU2 revealed some consistency in terms of stratigraphic levels. The excavators identified seven distinct layers through variation in silts, sands, tephra, and gravel content. Much of the material was transported into the cave via eolian activity, but some post-depositional sorting undoubtedly occurred as a result of slope wash, perched water tables, and gravity transport of moisture and sediments through seams in the cave roof. Of particular interest was a lens of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) and gravel in Quad B that began in level 8 and continued through level 12. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) associated with those levels include (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

### Test Unit 3

This unit was established after TP14 produced an (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) in level 5, (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) in level 6, and evidence of a feature that included substantial concentrations of both obsidian (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) piled into a mound. The unit was initially opened as a 1x1 with TP14 in the northwest corner and subsequently expanded into a 1x2 to expose more of the feature, then into a 2x2 as it became clear that the feature was situated in the center of the unit. The original 1x1 became Quad B in the 2x2. The feature was initially thought to be evidence of looting until the variety and quality of the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) surrounding it became apparent.

The feature was found very late in the project and there were no expectations of future work at the site, so a strategy was implemented to expose the feature as quickly as possible so that findings could be utilized to inform management considerations. Based on the results from excavating Quad B, we decided to remove the loose and disturbed overburden (ca. surface to 50 cm) in the other quads, bringing the unit down to level 5 or 6. The loose sediments were quickly screened for (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure #6. TU3, Quad B is staked, and TP14 is already excavated.



Figure #7. TU3, Feature 1 is visible as a mound surrounded by cobbles in the center of the unit. The (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) is in situ to the upper right.

but no (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were collected. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were collected from the overburden.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Figure #.8. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) recovered in Quad C, level 9.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure #.9. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) Quad D, level 9.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Figure #.10. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) from TU3, level 9; (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (left) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) right, shown actual size



TU3 provided unequivocal evidence that intact (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) deposits are still present in (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). The contrast between (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) is striking. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) produced very few complete (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) or other (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) except underneath the displaced boulder at the entrance. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) produced significant (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) in every test unit, and TU2 offered evidence of multiple (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) layers while TU3 produced an (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). Access and visibility for looting activities was much better in (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) whereas very little natural light could be had in (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) and screening would have to occur outside of the cave in order to identify (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA).

#### Test Unit 4

TU4 was a 1x1 m expansion of TP17 (in the northwest corner of the test unit) which was situated against the roof fall that separates the main chamber from the rest of the lava tube. The test unit was established as an exploration for other (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) that might be associated with (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) recovered in level 4 of TP17. Relatively few (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were yielded by TU4, which reached a comparatively shallow depth of 60 cm. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure #.11.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

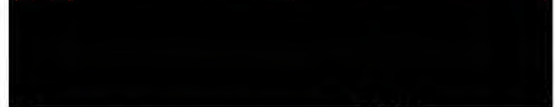


Figure #.12.

06-C3-TU4-5

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

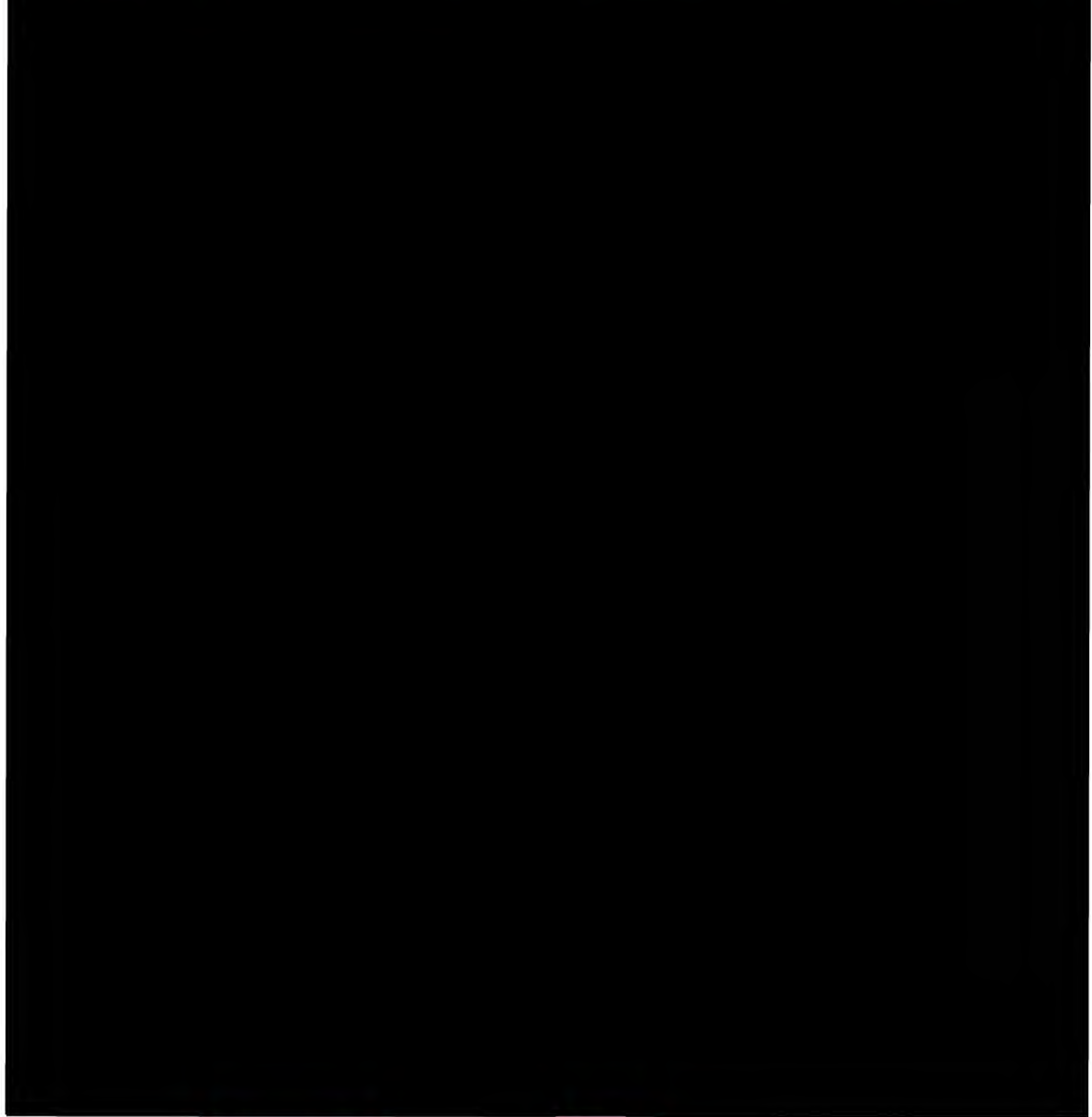


Figure #.12. Selected (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) from excavations at (b) (3) Cultural Resources shown actual size.

- |                                     |                                      |                                   |    |
|-------------------------------------|--------------------------------------|-----------------------------------|----|
| a.                                  | b.                                   | c.                                | d. |
| e. (b) (3) Cultural Resources 3-C-9 | f.                                   | g.                                | h. |
| i.                                  | j. (b) (3) Cultural Resources        | k. (b) (3) Cultural Resources 1-7 | l. |
| m.                                  | n. (b) (3) Cultural Resources -P12-8 |                                   |    |

Table #.6. Redmond

Cat. #	L.	W.	Th.	Wt.	Src.	Hyd	Remarks
Cave 3							
06-1-5	26.2*	16.1*	2.5	0.6*(cut)			
06-1-7	18.5*	-	3.9	0.7*(cut)		2.0	
06-2-2	14.3*	9.0*	3.2	0.4*(cut)		2.2	
06-2-A-6	14.5*	13.9	4.1	0.9*(cut)		-	
06-2-A-12	21.1	11.2	2.5	0.3 (cut)		1.0	
06-2-A-14	17.1*	13.5	2.8	0.5*(cut)		1.1	
06-2-B-13	17.2*	15.9	2.6	0.4*(cut)		1.2	
06-3-A-7	20.1	14.4	2.3	0.4 (cut)		NA	
06-3-B-9	25.9*	17.6	4.9	1.8*(cut)		-	
06-3-C-9	26.4	19.6	4.4	1.8		-	
06-3-D-9	35.4*	17.8*	4.3	2.4*(cut)		2.4	
06-4-2	23.7*	14.1	3.9	1.4*(cut)		2.2	
06-P3-6	41.3*	24.4	8.3	8.0*(cut)		5.3	
06-P12-8	56.4	21.0	7.4	7.52		-	
06-P12-6	-	-	-	-		2.0	
06-P14-5	34.8	18.9	4.9	2.0 (cut)		2.3	
06-P17-4	20.6	22.1*	3.2	0.6*(cut)		1.7	
06-P19-4	31.8*	24.4*	7.5	6.8*(cut)		3.8	

Notes:

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Table #.7. Metric attributes, geochemical sources and hydration data for

Cat. #	L.	W.	Th.	Wt.	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	Src.	Hyd.	Remarks
06-1-ISO-1	16.7*	9.5*	6.0*	0.9*(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.7	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-1-14B	16.0*	24.3*	5.0*	1.9*(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	3.0	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-1-14(2)B	-	-	-	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.4	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-1-6	33.2*	15.6*	5.8*	2.3*(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-1-8	15.2*	21.4*	5.2*	2.1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-2-B-1(3)	6.9*	8.0*	2.9*	0.1*(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.2	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-2-B-8	15.5*	5.2*	1.5*	0.1*(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	1.9	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-2-B-6B	39.2*	43.6*	11.6	23.5*(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.2	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-6	6.5*	5.6*	1.8*	0.1*	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-8	25.8*	21.8*	6.0*	1.29*	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-A-11	34.7*	30.6	6.2	8.6*(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-A-11(2)	48.9	17.9	4.9	4.4 (cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-B-11	32.0*	26.6	11.3	11.30*	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-D-6	10.4*	10.0*	2.9*	0.3*(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.6	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-P3-12-6	23.1*	8.2*	1.9*	0.3*(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-P19-3	7.4*	7.4*	2.1*	0.1*	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Notes:

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Notes:

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Table #.10. Cave

Cat. #	L.	W.	Th.	Wt.	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	Src.	Hyd.	Remarks
06-1-4	24.6	20.1	2.5	1.5(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	NA	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-1-8	48.2	39.8	8.1	20.4(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	NA	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-2-B-1	30.2	24.6	4.9	3.1(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.5	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-2-B-1(2)	26.9	14.2	2.7	1.3(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.3	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-2	25.3	12.9	4.3	1.4	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-9F	28.8	12.9	5.7	2.0	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-9F(2)	35.2	17.7	5.2	3.4	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-A-8F	37.3	20.3	2.8	1.7(cut)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.3	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-A-9	28.2	22.8	1.9	1.4	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.2	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-A-9F	24.8	25.0	4.6	2.25	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.9	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-A-9F(2)	35.3	12.5	5.5	1.8	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-A-10F	27.9	24.7	5.1	3.9	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-A-11	36.0	26.6	4.6	5.4	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-A-12	57.4	29.3	9.8	18.6	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-B-9	31.0	31.4	8.2	5.7	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.4	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-B-11	64.6	31.8	10.0	17.5	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.2	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-B-11	32.9	25.4	5.8	5.3	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-C-8	42.1	16.1	7.8	4.9	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.2	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-D-9	46.3	28.2	14.1	19.6	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-3-D-9	34.0	27.8	5.4	4.1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-P9-3	-	-	-	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-P11-7	49.3	31.7	8.5	10.5	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-P2-7	24.4	14.9	3.2	0.8	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	1.8	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-P12-13	31.3	21.6	3.9	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	-	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06-P19-4	20.9	11.7	4.9	0.7	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	2.5	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Notes:

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

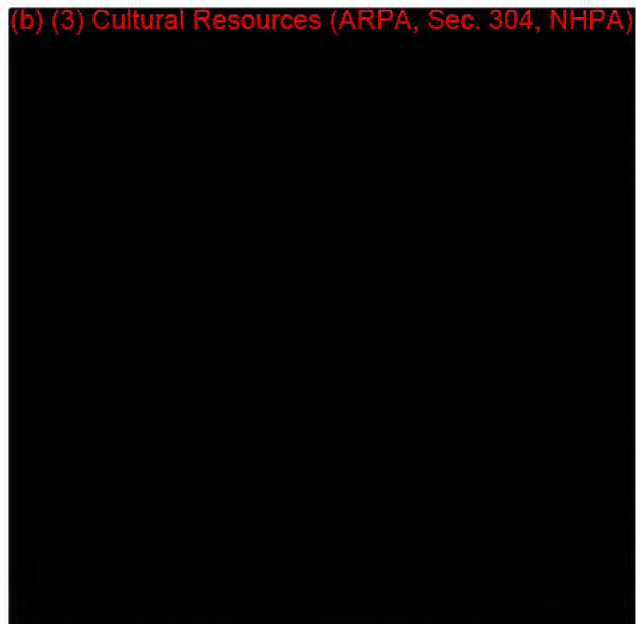


Figure #.13. Selected (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) shown  
actual size.

a.	b.	c.
d.	e.	f.
g.	h.	i.
j.	k.	l.
m.	n.	o.
p.	q.	r.
s.	t.	u.
v.		

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)






Table #.8. Redmond Caves

Cat. #	L.	W.	Th.	Wt.	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> P2-8	5.6	5.3	1.0	0.03	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> P10-7	7.7	6.9	1.2	0.10	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> P12-6	3.4	3.3	0.7	0.00	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> P12-13	2.2	3.5	0.8	0.00	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> P14-6	6.5	6.2	1.2	0.08	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU1-1	10.11	2.8	0.3	0.04	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU1-3	13.1	2.7	0.6	0.10	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU2-2	6.4	5.5	1.0	0.02	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU2-2	7.1	5.9	0.8	0.04	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU2-A-4	8.8	5.2	-	0.05	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU2-A-10	7.1	6.7	1.0	0.09	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU2-A-10	10.2	6.0	1.4	0.14	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU2-A-10	4.2	4.1	0.7	0.01	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU2-B-5	10.3	5.3	0.8	0.06	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU2-B-7	3.3	3.4	0.08	0.01	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU2-B-9	5.4	5.3	0.8	0.04	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU2-B-12	3.0	4.3	0.6	0.04	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU3-7	4.3	4.2	0.7	0.01	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU3-A-11	7.2	6.9	1.6	0.13	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU3-C-11	15.1	3.5	0.2	0.09	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU3-D-8	5.4	5.1	0.7	0.02	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU4-3	22.5	18.2	5.9	2.85	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU3-overburden	5.2	4.0	0.5	1.3	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU3-overburden	5.1	5.1	0.9	1.4	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
06- <sup>(b) (3)</sup> TU3-overburden	11.2	9.0	1.3	0.16	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Notes

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



## (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Figure #.14. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) from TP3, level 18, shown actual size.

Table #.9. Redmond Caves (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Cal. #	L.	W.	Th.	Wt.	Remarks
--------	----	----	-----	-----	---------

06- <sup>2015</sup> TU2-B-8	36.9	7.1x5.4	0.5-1.0	1.03	
-----------------------------	------	---------	---------	------	--

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

06-TU3-9	12.9	3.1	0.7	0.03	
----------	------	-----	-----	------	--

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

06-TU3-C-9	257.0	42.6	27.4	130.4	
------------	-------	------	------	-------	--

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

06-TU3-D-9	55.4	5.9	1.7	0.62	
------------	------	-----	-----	------	--

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

06-TU4-5	20.1	5.9	2.5	0.32	
----------	------	-----	-----	------	--

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

06-P3-12-1	27.7	2.8	2.4	0.17	
------------	------	-----	-----	------	--

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

06-P3-18-1	39.3	3.5	2.3	0.34	
------------	------	-----	-----	------	--

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

## Summary

(b) (3) Cultural Resources of the Redmond complex has great potential for future research due to the fact that deposits there exhibit multiple (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) levels, are quite deep, and contain a wide variety of materials, including (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). Looting activity is obvious, but the cave has not been vandalized to the same tragic extent as (b) (3) Cultural Resources. This is probably due to the poor interior visibility which makes it necessary to transport sediments outside for screening, and the difficulty of negotiating the low cave entrance with heavy loads like buckets of dirt. As a result, there is more evidence of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) activity in (b) (3) Cultural Resources including (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) than in any of the other caves.

From a management and interpretive standpoint, (b) (3) Cultural Resources is problematic. The low entrance means that any modifications for enhanced public access would require much earth removal and considerable expense, and would necessitate additional (b) (3) Cultural Resources (ARPA) investigations. To protect the (b) (3) Cultural Resources resources, it would be best to close off access to the cave with gates, but the cave is also a wonderful attraction for the public because of the hidden side channel in the interior and accessibility at both ends of the primary lava tube. I regularly bring students and other educational groups to the site and this passage is always among the most popular events of the tour, especially the descent into the cave using the entrance by (b) (3) Cultural Resources. The focus of educational/interpretive signage should be on (b) (3) Cultural Resources and regular site monitoring of (b) (3) Cultural Resources should be undertaken to insure that looting is kept to a minimum.

## Redmond Cave

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)

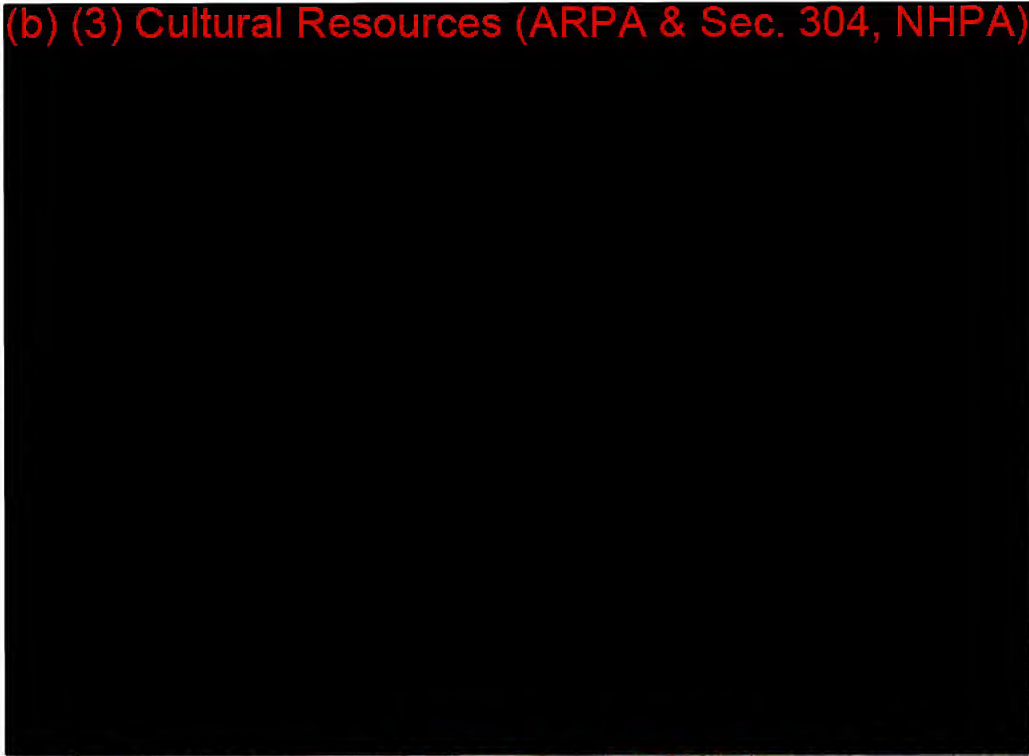


Figure 5.1. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) Entrance, (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

## Excavation and Summary

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) investigations at (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) occurred during the 2006 field school. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) appeared to have relatively little looting damage in comparison to (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) though there were certainly pits on the floor and along the edges in naturally lit areas. One has to crouch to maneuver under the low entrance, but the ceiling rises quickly to a comfortable height as one proceeds along a narrow trail through roof fall into the main chamber. There, the cave widens and the large interior dimensions quickly become apparent. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) curves slightly to the northwest and constricts after approximately 140 meters, with a side chamber to the southwest beginning approximately 100 meters in.

According to the April 8, 1954 edition of the Redmond Spokesman, Cave 4 was opened by explorers from the local Lions Club on April 4, 1954, utilizing a Redmond-owned "Scoopmobile" and a grain conveyor to remove about 30 feet of fill and carry it away from the entrance. They noted bones and charcoal at the time, and signs that water dripped through the roof creating a stream channel through the interior. The cave was clearly sealed for a considerable length of time. There is little in the way of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) material, the absence of which may account for the relative lack of looting within the cave. The absence of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) seems unlikely for any other reason, given the protected setting and the comfortable interior dimensions. It is not currently known if the cave entrance opened and closed periodically over the years, but multiple peaks in the hydration readings from obsidian (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) could shed light on this possibility.

A total of 18 50x50 cm test pits and one 1x1 m unit was excavated in (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (Figure #.2). This effort resulted in the recovery of a (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure #.2. Locations of test pits within (b) (3) Cultural Resources TP 7 was expanded into Test Unit 1, with the test pit in the northwest corner. The entrance is to the right.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



(b) (3) Cultural Resources  
173-

(b) (3) Cultural Resources

7-10

Length: 39.9 mm

Width: 26.4 mm

Thickness: 6.8 mm

Weight: 7.14 grams

Figure #.3. Opposing views of (b) (3) Cultural Resources recovered from level 10 of TP7 shown actual size.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

A large black rectangular redaction box covering the top portion of the page.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

A large black rectangular redaction box covering the middle portion of the page.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

A large black rectangular redaction box covering the lower middle portion of the page.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

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(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

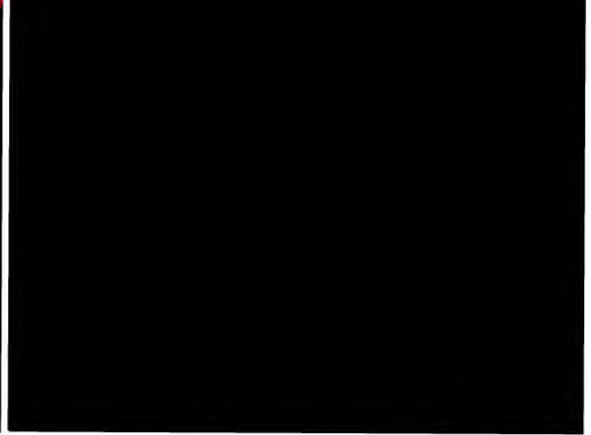
A black rectangular redaction box covering the bottom right portion of the page.


Figure #4.  recovered from TU-1, exterior and interior views.  
The scale bar is 5 cm long.

Table #.1. 2006 Redmond Caves Excavations: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

	1	2	3	Unit (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	5	7	12	13
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)							
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
Total								

Table #.2. 2006 Redmond Caves Excavations: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

	1	2	3	4	Unit (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	6	7	8	9	10	11
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)										
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
Total											

	12	13	14	15	Unit (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)	17	18	TUI
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)							
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
Total								



Table #.3. 2006 Redmond Caves Excavations: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (presence "x" or absence "-")

	1	2	3	4	5	6	7	8	9	10
Unit RC4-										
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)									
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

	11	12	13	14	15	16	17	18	TUI
Unit (b) (3) Cultural Resources									
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)								
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (5) Cultural Resource [REDACTED] has several unique characteristics that are important to consider in terms of management objectives. First, it appears to have been utilized by humans for a very limited duration due to lack of access. As a result, the cave may offer important information about a variety of small fauna inhabiting the area over thousands of years. In a protected setting, it is possible that a deep and uninterrupted sequence of faunal deposition can be found. This record could be very significant for paleoenvironmental studies of the locality. Second, the presence of packrat middens within the cave and the accumulated vegetation associated with them, may offer similar clues to the flora of the region over time. Finally, even though (b) (5) Cultural Resource [REDACTED] offers relatively little in terms of (b) (5) Cultural Resource [REDACTED] resources, the relationship of the (b) (5) Cultural Resource (ARPA, sec. 304, NHPA) [REDACTED] that may have originated from (b) (5) Cultural Resources (ARPA, Sec. 304, NHPA) [REDACTED] is one that should be explored, preferably utilizing large scale block excavations. Obsidian hydration studies would be an important aspect of this work, and a sufficient sample would allow insights into whether the (b) (5) Cultural Resource (ARPA, Sec. 304, NHPA) [REDACTED] material represents a single period or multiple periods of (b) (5) Cultural Resource [REDACTED] within the cave.

As mentioned previously, (b) (5) Cultural Resource [REDACTED] has a low entrance and modifying it to allow easy access for visitors would require a significant alteration either to the floor or roof, with the floor being the most practical approach. Since most of the (b) (5) Cultural Resource [REDACTED] material was recovered near the entrance and the temporal range of (b) (5) Cultural Resource [REDACTED] is not well understood, any ground-disturbing activities to enhance access (or for any other management objective) should be preceded by additional (b) (5) Cultural Resource (ARPA, Sec. 304, NHPA) [REDACTED] evaluation.

## Redmond Cave

(b) (3) Cultural Resources

### (b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)

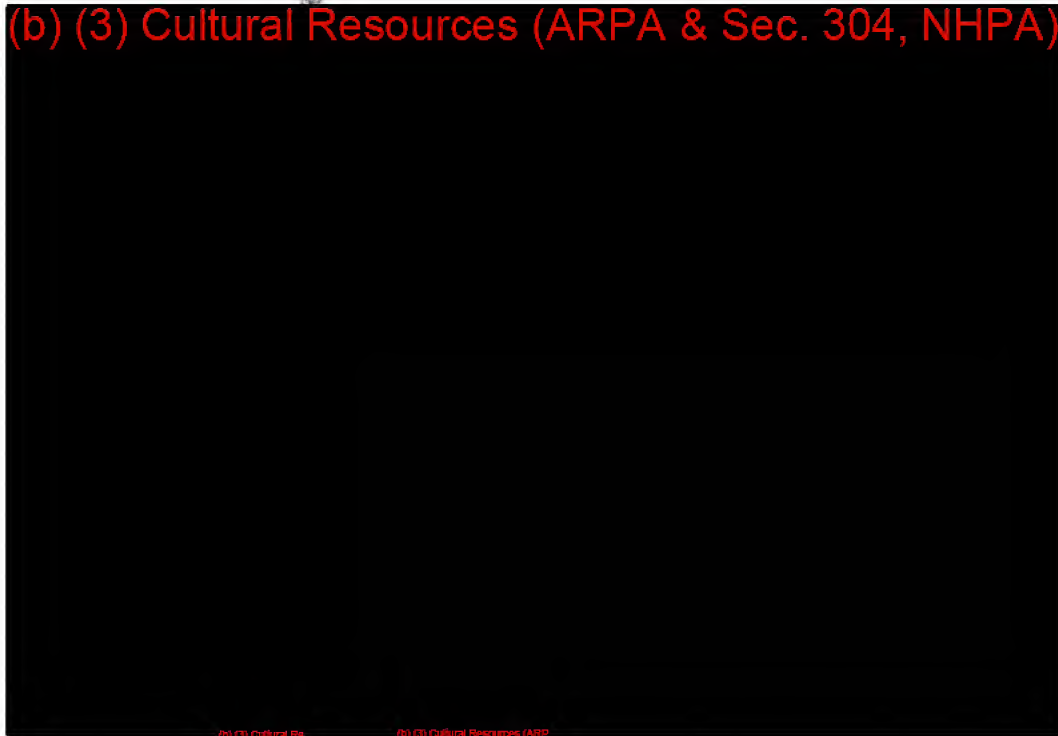


Figure 5.1. (b) (3) Cultural Resources (ARPA) entrance, (b) (3) Cultural Resources (ARPA) The cave ceiling is approximately one meter in height.

### Excavation and (b) (3) Cultural Resources Summary

(b) (3) Cultural Resources (ARPA, Sec. 304) investigations at (b) (3) Cultural Resources the southeastern-most lava tube on the parcel, were hampered by very limited accessibility. The cave entrance is five meters wide by one meter high, with a low ceiling that tapers off within a few meters of the entrance due to the presence of fill and the constraints of its natural architecture. As a result, the cave received less attention than the other four in the lava tube complex. Local inhabitants have referred to (b) (3) Cultural Resources as the “Ice Cream Cave” because, at one time around the turn of last century, it was said that people could come here to get ice at any time of the year and it is only in recent decades that it has ceased to be useful for that purpose. It is also rumored to have once been attached to the main stem of (b) (3) Cultural Resources. It is difficult to imagine how the acquisition of ice or passage to (b) (3) Cultural Resources could have been possible based on (b) (3) Cultural Resources current interior dimensions, but recent roof collapse may have altered the interior dimensions considerably.

A total of four 50x50 cm units were excavated in 10 cm levels at (b) (3) Cultural Resources. Unit (b) (3) Cultural Resources-1 was located at the left side of the entrance, (b) (3) Cultural Resources-2 was half a meter into the cave near center, (b) (3) Cultural Resources-3 is two meters inside of the cave (as far in as the excavators could negotiate given the dimensions) and (b) (3) Cultural Resources-4 was four meters from the cave entrance on the approach trail. The units were chosen to give a representative sample of (b) (3) Cultural Resources materials in all spatial contexts, both inside and outside of the dripline. The fill was surprisingly deep in most contexts. (b) (3) Cultural Resources-1 reached a depth of 100 cm and (b) (3) Cultural Resources-2 was the shallowest at 40 cm. (b) (3) Cultural Resources materials were sparse and never exceeded 60 cm in depth. Collected (b) (3) Cultural Resources consisted of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (Table 5.2.).

(b) (3) Cultural Resources (ARPA & Sec. 304, NHPA)



Figure 5.2. Test Pit (b) (3) Cultural Resources, within (b) (3) Cultural Resources. The unit was backfilled upon completion and dug out in the winter of 2007 by either rabbits or rodents.

Sediments both inside and outside of the cave consist of mixed sand and volcanic ash, with angular gravels composing about 5% or less of the content and bedrock at varying depths. The entrance of (b) (3) Cultural Resources has collapsed westward over time, creating a broad level entryway in front of the cave that tapers back to the existing cave opening. The old roof is overlain with aeolian sand and ash creating a rocky surface of undetermined age that probably overlies the old lava tube floor. There is no true stratigraphy to the sediments, though relatively recent wind winnowing has created thinner and coarser layers near the surface.

Table 5.1. 2006 Redmond Caves Excavations: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Level	Unit (b) (3) Cultural Resources			
	1	2	3	4
1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)			
2				
3				
4				
5				
6				
7				
8				
9				
10				

Table 5.2 2006 Redmond Caves Excavations: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

	1	2	Unit (b) (3) Cultural	3	4
Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)				
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
Total					

To summarize (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) Based on our 2006 findings,  
 there should be no need for specific protective measures at (b) (3) Cultural Resources



# **REDMOND CAVES**

## **ARCHAEOLOGICAL PROJECT**

**An Interim Report: Fall 2002**



Compiled and Edited by  
Margaret M. Helzer

With contributions by:  
Cynthia Beckner, Eric Jorgenson, Davis Odom, Jeff Perreault,  
Roger Riolo, Jean Stark, and Todd Volkenand

State Museum of Anthropology  
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2003



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## TABLE OF CONTENTS

LIST OF FIGURES .....	iii
LIST OF TABLES .....	v
CHAPTER 1: INTRODUCTION .....	1
CHAPTER 2: ENVIRONMENTAL SETTING.....	6
CHAPTER 3: CULTURAL BACKGROUND.....	7
Ethnographic Background .....	
Archaeological Background.....	9
Historic Background .....	9
CHAPTER 4: PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS.....	11
Archaeological Work Conducted by Robert Heizer (1941) .....	11
Archaeological Work Conducted by John Fagan (1998).....	19
CHAPTER 5: REDMOND CAVES SURVEY RESULTS .....	22
Identified Sites and Isolates .....	24
Disturbances Identified .....	29
CHAPTER 6: EXCAVATION RESULTS.....	36
Proposed Parking Lot Probes.....	36
Site [REDACTED] .....	38
Excavation Results.....	39
Debitage Analysis.....	43
Summary.....	45
CHAPTER 7: CONCLUSION.....	46
BIBLIOGRAPHY.....	47

## LIST OF FIGURES

Figure 1. View of (b) (5) Cultural Resources looking west toward Cascade Mountains .....	1
Figure 2. Location of Redmond Caves Project Area .....	2
Figure 3. Proposed development for Redmond Caves project (Master Plan 1998).....	3
Figure 4. Physiographic and geologic provinces of Oregon and Washington, Showing location of High Lava Plains .....	6
Figure 5. Tribal territories of the Pacific Northwest, showing location of Redmond. (Adapted from Walker 1998) .....	8
Figure 6. Redmond Caves (b) (5) Cultural Resources (NHPA, Sec. 304, NHPA) recovered by Robert Heizer in 1941 .....	14
Figure 7. Redmond Caves (b) (5) Cultural Resources recovered by Robert Heizer in 1941 .....	15
Figure 8. (b) (5) Cultural Resources (NHPA, Sec. 304, NHPA) specimen number 1-11936 .....	16
Figure 9. Top: (b) (5) Cultural Resources (NHPA, Sec. 304, NHPA) 1-11930); bottom: (b) (5) Cultural Resources (NHPA, Sec. 304, NHPA) (1-11931) .....	17
Figure 10. Obsidian (b) (5) Cultural Resources (NHPA, Sec. 304, NHPA) (1-11925, 1-11940) and (b) (5) Cultural Resources (NHPA, Sec. 304, NHPA) 1-11933) .....	18
Figure 11. (b) (5) Cultural Resources specimen number 1-11929 .....	18
Figure 12. Redmond Caves parcel with archaeological resources identified by AINW noted (Fagan 1998) .....	20
Figure 13. Students recording a site on survey .....	22
Figure 14. Redmond Caves parcel, showing identified sites and isolates .....	23
Figure 15. (b) (5) Cultural Resources (NHPA, Sec. 304, NHPA) recovered during survey of Redmond Caves Parcel .....	25
Figure 16. Mapping site (b) (5) Cultural Resources pin flags marking flakes.....	26
Figure 17. Garbage and debris near burned juniper tree.....	29
Figure 18. Glass and wood dump near burned juniper tree .....	30
Figure 19. Can dump.....	30

Figure 20. Stacked rock wall (background) and industrial debris .....	31
Figure 21. Wood and plastic debris .....	31
Figure 22. Large industrial dump.....	32
Figure 23. Large industrial dump.....	32
Figure 24. Tree house .....	33
Figure 25. Modern camp on edge of proposed parking lot, probe 6.....	33
Figure 26. Evidence of recent camping in entrance of [REDACTED] .....	34
Figure 27. Graffiti on entrance of [REDACTED] .....	34
Figure 28. Graffiti on rock wall outside of [REDACTED] .....	35
Figure 29. Graffiti and evidence of digging inside [REDACTED] .....	35
Figure 30. Location of probes in area of proposed parking lot and visitors' center. Caves, sites, and isolates also noted.....	37
Figure 31. Sketch map of [REDACTED] with location of probes .....	38
Figure 32. Excavation underway at [REDACTED] .....	40
Figure 33. Excavation in proposed parking lot area .....	40
Figure 34. Amount of [REDACTED] per level in [REDACTED] probes.....	42
Figure 35. [REDACTED] by level for [REDACTED] Probe 3 .....	42
Figure 36. Analysis of [REDACTED] by type and size from [REDACTED] .....	44

## LIST OF TABLES

Table 1. Redmond Caves (b) (5) Cultural Resource collected by Robert Heizer in 1941 .....	11
Table 2. Redmond Caves (b) (5) Cultural Resource recovered by Robert Heizer in 1941 .....	12
Table 3. Probes in area of proposed parking lot and visitor's center.....	36
Table 4. (b) (5) Cultural Resource probes by level .....	41



## CHAPTER 1: INTRODUCTION

This report represents the first stage in a five-year project that involves archaeological investigations of a [REDACTED] parcel, owned by the Bureau of Land Management and located [REDACTED] of Redmond, Oregon (Figures 1 and 2). The Bureau of Land Management and the City of Redmond have entered into a collaborative agreement to develop the parcel for public use. Currently undeveloped, the parcel contains five lava tube caves and a network of unmaintained dirt roads for access. The caves, along with the natural vegetation, draw the interest of local hikers, bird watchers, rock collectors, and nature lovers. They also draw local teen-agers, drug-users, and the homeless. The [REDACTED] parcel has become a convenient place to “party,” deface cave walls and rocks with spray paint, set up temporary camps, and dump garbage. Archaeological resources are also known to exist both inside and outside of the caves, making this parcel attractive to [REDACTED] collectors as well.



Figure 1. View of Cave [REDACTED] looking west toward the Cascade Mountains.



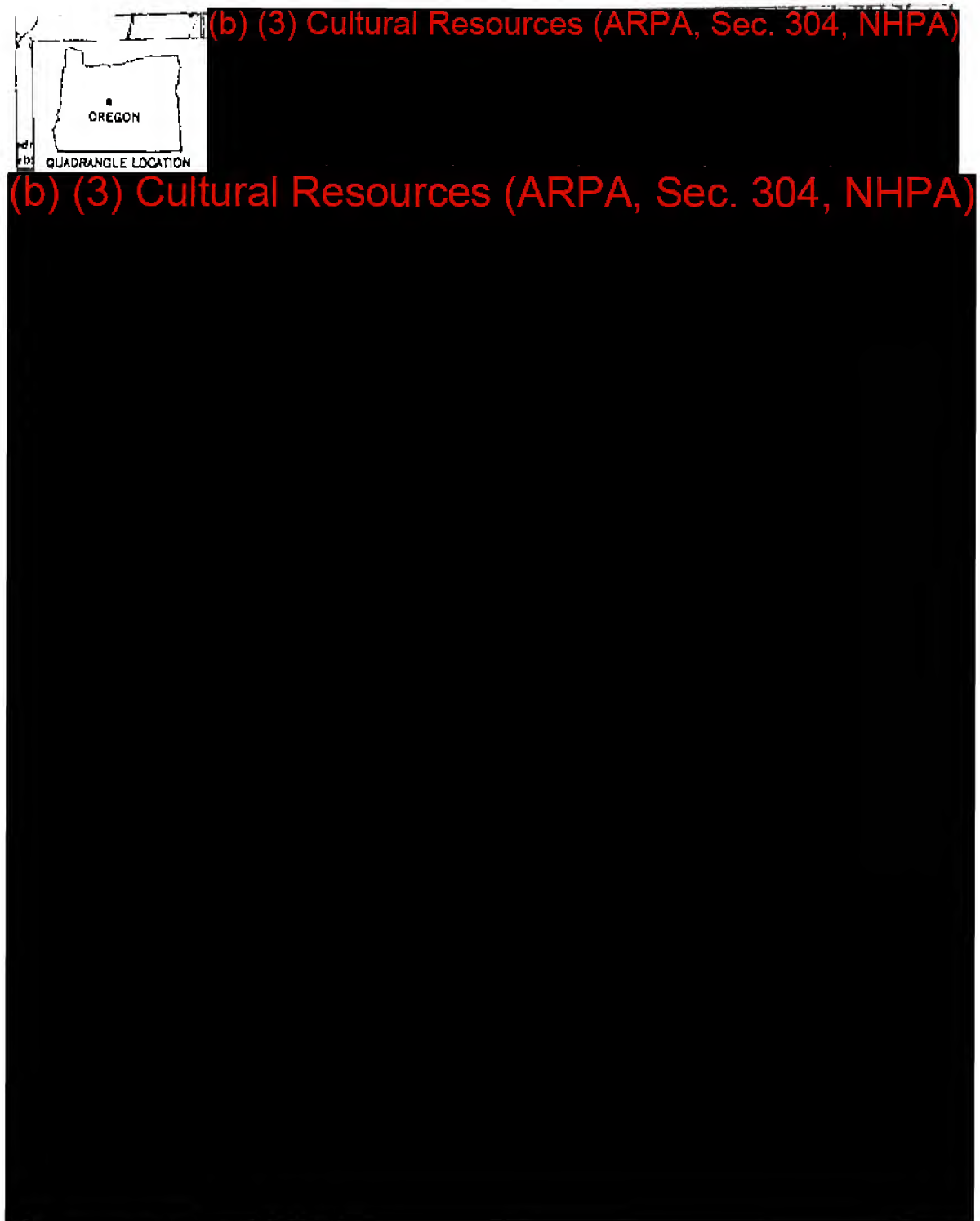


Figure 2. Location of Redmond Caves Project Area.

The proposal offered by the City of Redmond is to convert the property into to a city-managed park with a parking lot, restroom, visitor's center, outdoor classroom, access roads, walkways, trails, and green spaces (Figure 3). The intent is to develop a park-like setting that would encourage safe and educational activities and discourage destructive and illegal ones. The archaeological investigations required before the proposed development takes place are being conducted by the University of Oregon, State Museum of Anthropology. Previous archaeological studies at the Redmond Caves parcel include excavations in two caves, conducted by Robert Heizer in 1941, and a reconnaissance survey conducted by Archaeological Investigations Northwest (AINW) for the Redmond Caves Master Plan (Fagan 1998).

The Redmond Caves Archaeological Project is conceived of as a multi-year program designed to identify and evaluate the archaeological resources found within the parcel. The investigations will be conducted as part of a University of Oregon class entitled "Field Studies in Archaeology" (ANTH 408), which meets fall and spring terms and is offered through the UO Field Studies Center in Bend, Oregon. This work will guide planning, by designating areas where visitor enhancements might be made without damaging cultural resources, by identifying measures for protecting significant resources, and by developing a body of knowledge on the nature of archaeological resources for public interpretation and education.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure 3. Proposed development for Redmond Caves project (Master Plan 1998).

Although the Redmond Caves Archaeological Project will be on-going (i.e., conducted in separate phases over several years), this report provides a summary of the work conducted by the University of Oregon Fieldwork in Archaeology class for Fall term, 2002. Of particular focus for the Fall 2002 term was a pedestrian survey of the [REDACTED] parcel, the mapping of sites and isolated finds, subsurface testing in the area of the proposed parking lot and visitors center, subsurface testing in one site, analysis of collected [REDACTED] and analysis of [REDACTED] collected in the caves by Robert Heizer in 1941.

The survey resulted in the identification of [redacted] sites [redacted] (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) and [redacted] (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). The contents and locations of these are compared with the previously identified archaeological resources. Subsurface testing on the parcel involved the excavation of 26 probes measuring 50 x 50 cm. Twenty probes were dug in the proposed parking lot area; six probes were dug in site [redacted] 1, identified during survey. Results from these initial investigations suggest that the Redmond Caves and the surrounding sites were occupied during the Middle to Late Holocene. While the diversity of [redacted] recovered from the within the caves by Heizer (1941) point to multi-use activities, further investigations are needed to better assess the archaeological components both within the caves and in the sites recorded outside the caves.

## CHAPTER 2: ENVIRONMENTAL SETTING

The Redmond Caves [REDACTED] BLM parcel lies within the northwestern area of the High Lava Plain, in close proximity to the Deschutes River Basin and on the southern extension of the Columbia Basin physiographic province (Figure 4). The area is made up of geologically young lava and basalt flows, some younger than 10,000 years (Aikens 1993). The majority of the surface soils present at the site are formed in ash from the 7500 year old eruption of Mt. Mazama. Approximately 2000 square miles are covered, in varying depths, with ash and pumice from this eruption 6800 radiocarbon years ago. There are scattered cinder cones and buttes in the area associated with more recent volcanic activity. Miocene age lava flows make up the Columbia River Basalt formations which underlies the entire province (Franklin & Dryness 1988), and Plio-Pleistocene soils, formed under shrub and grassland vegetation, overlie it. This was, and continues to be, an area of transition from the Great Basin province to the southeast, and the Cascade Range province to the West.

The area can be characterized as a semi-arid zone with a continental temperature regime (Cheatham 1992). The plain slopes gradually to the north as part of the Deschutes River drainage and is one of the southern portions of the greater Columbia River Plateau. Most secondary streams in the area are ephemeral because of scant precipitation and porous bedrock. Summers are hot and dry. Average annual precipitation in the area is 12 inches. Elevation of the Redmond Caves averages 3,050 ft. ←

Ponderosa forests are widely distributed beyond the pumice plateau region. At lower elevations, below 4000 feet, they abut with sagebrush (*Artemisia tridentata*) steppe or open sagebrush-juniper (*Juniperus occidentalis*) woodlands (Franklin & Dryness, 1988), typical of what is found at the Redmond Caves. Rabbitbrush is also found in this area.

The Redmond caves are within the Upper Sonoran Life Zone (Bailey 1936). Animals represented include large and small game animals, as well as birds, reptiles and fish. Mammal species probably important to native peoples are jackrabbits, black bear, mule deer, white tailed deer, mountain sheep, gophers, and wood rats. Birds include grouse, ducks and geese. Fish were available in the nearby Deschutes River. ↗ M

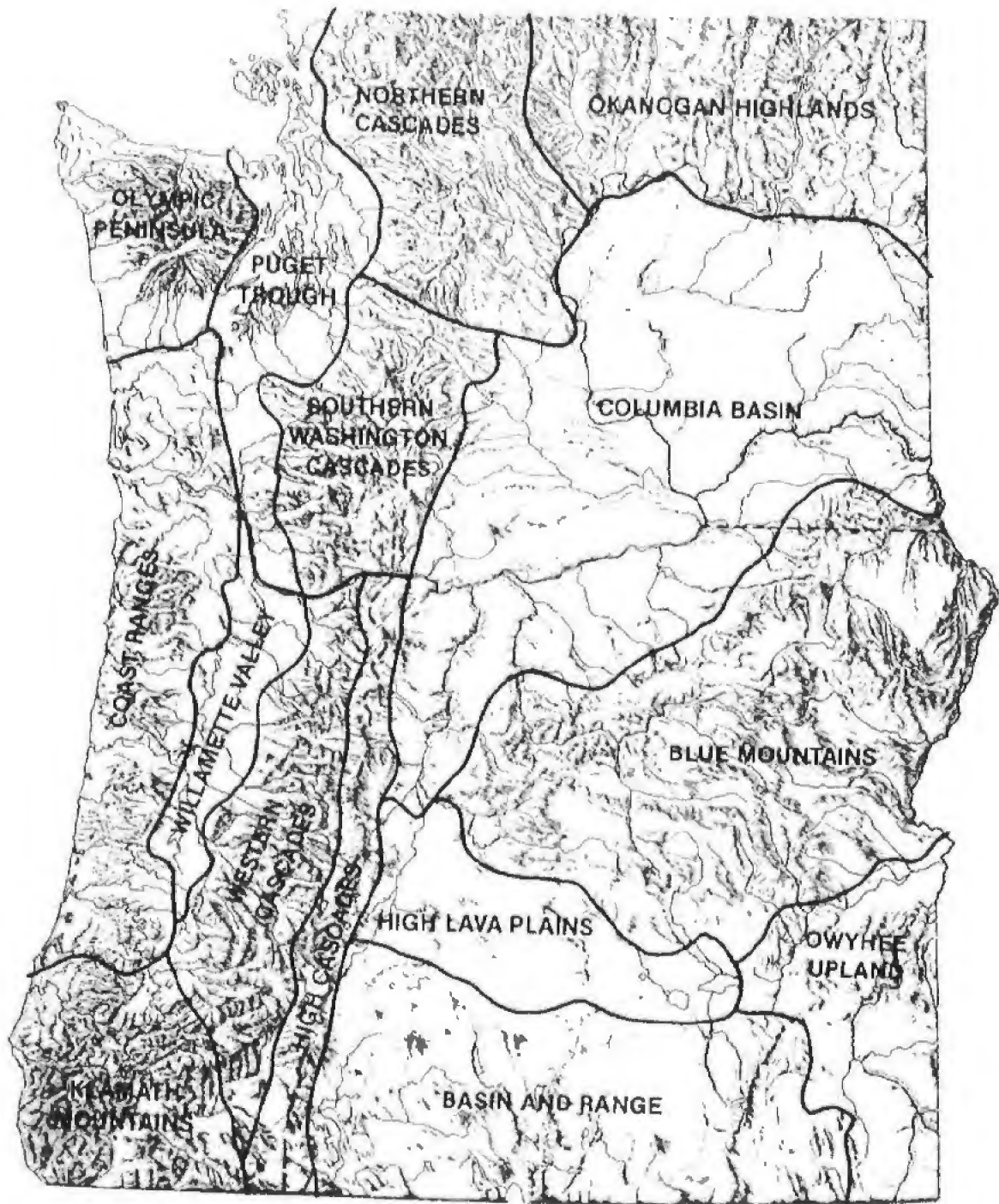


Figure 4. Physiographic and geologic provinces of Oregon and Washington, showing location of High Lava Plains. (Franklin and Dryness 1988)

## **CHAPTER 3: CULTURAL BACKGROUND**

The Redmond Caves area is located in a zone of cultural transition between the southern Columbia Plateau and the northern Great Basin (Figure 5). Redmond Caves, and the associated sites outside the caves, are located in the heart of this cultural and geographic transition zone and most likely will reflect these cultural uses and patterns observed from ethnographic and archaeological records.

### **Ethnographic Background**

The Redmond area lies on or very near a major prehistoric trade artery along the Deschutes River corridor (French and French 1998). However, very little is known concerning the people who occupied this transition area prior to Euroamerican contact. At least since the protohistoric era, this area saw regular use by the Northern Paiute of the Great Basin and Sahaptin people of the Southern Columbia Plateau (Zucker et al. 1983), and intermittent use by the Klamath and the Upper Santiam Molala.

The Upper Santiam Molala inhabited the High Cascade and Western Cascade region. However, their seasonal travels have been recorded to the eastern slopes of the Cascades, as little as 20 miles to the west of Redmond Caves (Zenk and Rigsby 1998). The Molala language, now lost, was a dialect isolate of Sahaptin, more closely related to the Cayuse language than that of their neighbors. Due to the introduction of Euroamerican diseases, much of this isolated upper mountain culture was lost prior to contact (Zenk and Rigsby 1998).

The Klamath and Modoc were known to traverse this area annually in their travels to and from The Dalles for trade and fishing. The extent of their influence in the area is unknown (Stern 1998). However, the Klamath were known to hunt the area of the upper Deschutes River (Zucker, Hummel, and Hogfoss 1983). Also, evidence exists of an expanded Klamath influence in the northwestern Great Basin possibly dating to earlier stages of the late Holocene period (Oetting 1990).

Due to the close proximity of the Northern Paiute and the Southern Columbia Plateau Sahaptins, it likely over time these two cultures used and influenced this area most extensively (Connolly 1999; Zucker, et al. 1983). It can be surmised that the root gathering, fishing, and hunting sites of this portion of the High Lava Plain were shared at various times by several groups, as it has been documented in the Stinkingwater root grounds, upper regions of the Harney Basin, along the John Day River, and near Shaniko and Prineville (Connolly 1999). It should be noted that there is evidence of some Northern Paiute dominance in the area in the protohistoric and historic periods (Connolly 1999).

On the one hand, the ethnographic history is limited in this area and may always remain clouded. The protohistoric era is further complicated from the introduction of the horse which had a major impact on local Native American cultures and traditional



territories. Also, Euroamerican diseases introduced during this era sharply decreased populations which most likely changed cultural patterns prior to contact (Hunn 1990).

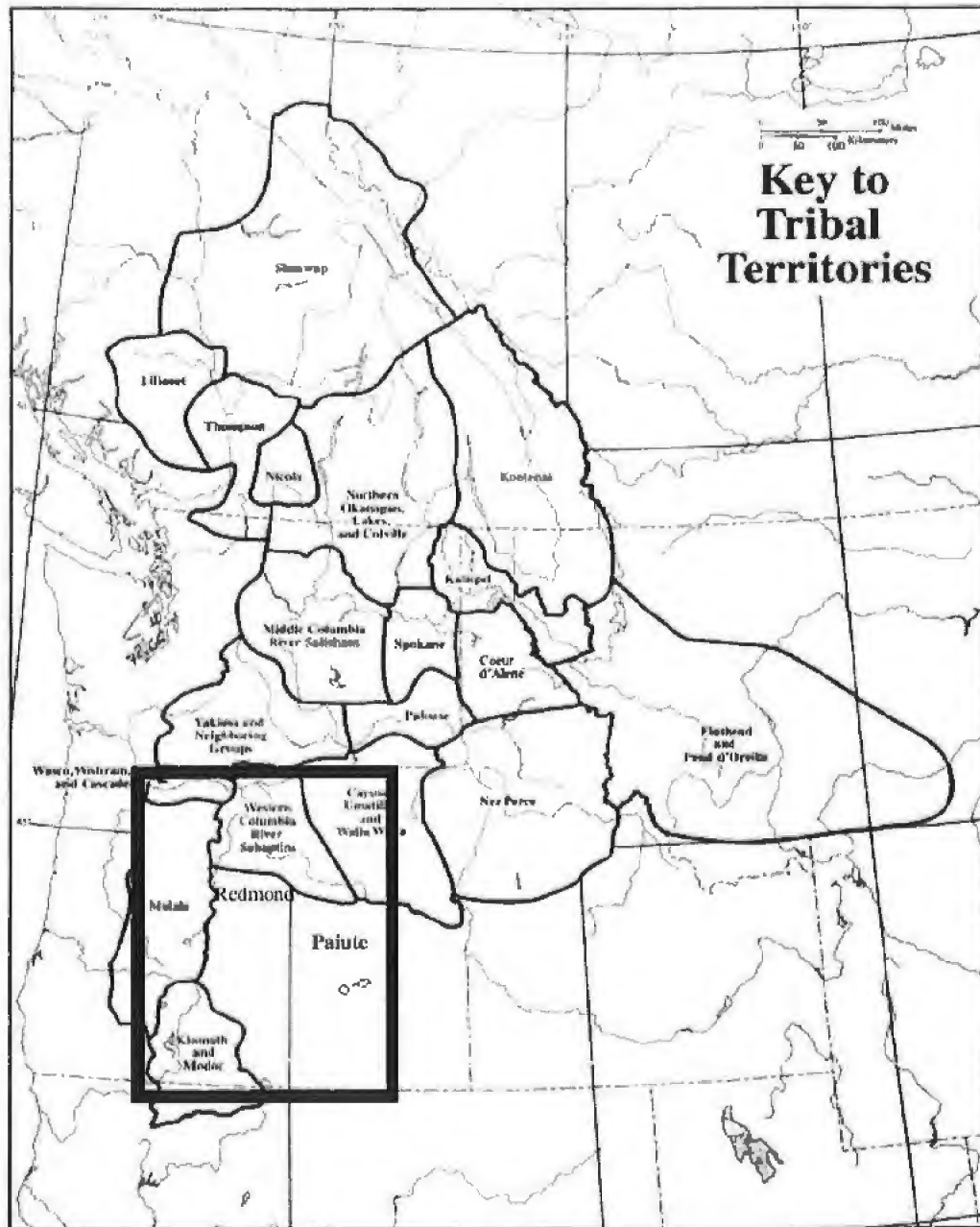


Figure 5. Tribal territories of the Pacific Northwest, showing location of Redmond. (Adapted from Walker 1998).

## **Archaeological Background**

The earliest documented evidence of human habitation in the Central Oregon corridor can be traced to three main locations. To the north, on the Columbia River, the Road Cut Site dates to ca. 11,000 BP (Cressman et al. 1960). To the south, the Paulina Lake site occupied by ca. 11,000 years ago, is the location of a 9500 year old house floor (Connolly 1999). Fort Rock Cave, to the southeast, dates to about 11,000 years ago (Bedwell 1973). These sites are located up to 100 miles from the Redmond Caves.

Early Holocene habitation of the region containing Redmond Caves is poorly documented partially due to comparatively recent geological events from Mt. Mazama. There is evidence of a more permanent settlement throughout this area during the Middle to Late Holocene with a trend toward seasonal or specific use sites during the Late Holocene to Historic times (Connolly 1999). The Bon Site, located approximately 13 miles to the south of Redmond Caves, represents this trend very well. In the north block of this site, evidence of a pithouse was discovered and obsidian hydration dates were obtained suggesting occupation between 6000 BP and 4000 BP (Connolly and Byram 2001). The middle and southern blocks of this site revealed evidence of a more seasonal hunting and bone reduction site. Dates obtained from the two southern blocks were from the late Holocene and Historic periods (Connolly and Byram 2001).

Similar results have been obtained from archaeological investigations in the areas to the south and north of Redmond. Lava Butte, Round Butte, and Lava Island Rockshelter all represent sites which reflect a pattern of a more sedentary Middle Holocene lifestyle and a more mobile lifestyle in the Late Holocene and protohistoric periods (Aikens 1993).

## **Historic Background**

Historically, this area was ignored and bypassed by most Euroamerican explorers and settlers until the late nineteenth century. Peter Skene Ogden of the Hudson's Bay Company first entered the area in 1826. His trapping brigade came south along the Deschutes and followed the Crooked River to the Ochocos and returned over Newberry Crater to the upper Deschutes (Brogan 1964). Nathaniel Wyeth, also in search of beaver, searched the west area of Redmond, the Deschutes River, and along the Metolius River in 1834 (Wyeth 1984). John C. Fremont, of the Army Corp of Topographical Engineers, traversed the area west of the Deschutes in his exploration from The Dalles to California in 1843 (Stewart 1999). Williamson and Abbot covered much of the same area in their railroad survey of 1855 (Brogan 1964).

Early pioneer and military roads also passed by the Redmond area. The Meek party of 1845 passed to the east of the area in search of The Dalles. In the 1860's the McKenzie and the Santiam passes were being used for east-west traffic by the military, gold seekers traveling to eastern Oregon and Idaho, and cattlemen driving stock to

mining communities and establishing ranches east of the Cascades. The Huntington Road was built originally to east of Redmond area in 1867 through the community of O'Neil, as it connected the Dalles with Fort Klamath (Neilson, et al. 1985). In 1878 Andrew J. Tetherow settled along the east bank of the Deschutes River approximately five miles to the west of Redmond Caves. There he irrigated farmland and began operation of a cable ferry across the Deschutes River (Brogan 1964).

It was a series of land and water reclamation acts that eventually brought settlement to the Redmond area. The Desert Land Act of 1877, the Carey Desert Land Act of 1894 (Tasa and Connolly 1999), and the United States Reclamation Act of 1902 provided settlers with larger land claims and a means to extract water from the nearby rivers. It was in this environment that Frank T. Redmond filed a land claim on an area between Tetherow Crossing on the Deschutes River and O'Neil on the Crooked River in 1905. Water was soon available from a system of canals. The following year the town of Redmond was platted (Brogan 1964). Redmond was established permanently as the Oregon Trunk Railroad was completed through the community in 1911 (Brogan 1964). The Redmond area today is still primarily irrigated by canal systems.

## CHAPTER 4: PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

Previous archaeological investigations in and around the Redmond Caves include excavations conducted by Robert Heizer in 1941 and a reconnaissance survey by John Fagan and Jo Reese of Archaeological Investigations Northwest (AINW) in 1998. The caves were recorded on a state of Oregon site record form by R. Lee Lyman in 1983.

### Archaeological work conducted by Robert Heizer

Robert F. Heizer conducted archaeological testing in two Redmond caves in the spring of 1941. [REDACTED] from this excavation are housed in the Oregon State Museum of Anthropology in Eugene, Oregon and are reviewed here. Unfortunately, Heizer's field notes and/or report of the excavations have not been located and it is not as yet known if they still exist. Attempts by the UO class to track these documents at the museum in Eugene and at the Bancroft Library at the University of California Berkeley were unsuccessful. Therefore, knowledge of field methods employed in the excavations and exact provenience data associated with collected [REDACTED] are limited. For instance, no maps were associated with the collection, making it difficult to assess whether the numbering system of the caves matches the one currently in use. Further, the exact location of the test units within the caves is not known; nor is the mesh size of the screens Heizer might have used in his excavations. Nevertheless, the University of Oregon Field Studies class provides a basic description of the [REDACTED] recovered from Redmond Caves.

**Table 1. Redmond Caves** — **collected by Robert Heizer in 1941.**

(b) (3) Cultural Resource	(b) (3) Cultural Resource	(b) (3) Cultural Resource	(b) (3) Cultural Resource	(b) (3) Cultural Resource
Class	Test Pit	Trench	Surface	Total
(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)				
Total	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)			

Table 2. Redmond Caves (b) (5) Cultural Resources recovered by Robert Heizer in 1941.

Specimen Number	Length	Width	Thickness	Weight (g)	Description
(b) (5) Cultural Resources TP					
1-11922	34.7	24.4	3.1	0.9	(b) (5) Cultural Resources (NHPA, Sec. 304, NHPA)
1-11922	26.6	20	4.4	2.43	
1-11923	10.5	18.2	5	1.16	
1-11924	37.8	33	5	8.82	
1-11925	16.8	26.9	5.9	3.36	
1-11925	1.3	2.3	5.3	1.76	
1-11925	32.2	27.2	3.4	2.93	
(b) (5) Cultural Resources TR 6-12"					
1-11932	--	18.5	4.6	1.55	
1-11932	33.3	23.4	4.6	3.14	
1-11932	19.3	15.5	1.8	0.36	
1-11932	--	19.7	4.7	2.73	
1-11932	--	17.5	4.6	0.81	
1-11932	27.2	20.8	3.9	2.15	
1-11932	15	18	5.3	1.17	
1-11930	49.4	41.6	39.8	51.12	
1-11931	118.9	28.8	18.5	95.58	
1-11933	31.6	27.5	4.3	3.83	
1-11936	85.4	81.4	31.4	244.7	
1-11929	123.5	93.8	50	816.9	
(b) (5) Cultural Resources TR 12-18"					
1-11937	29	18.6	4	1.86	
1-11939	37.8	11.5	4.1	1.18	
1-11939	34.8	23.2	6.8	6	
1-11939	22.2	23.4	5.7	2.91	
1-11939	27.4	23.3	5.2	2.46	
1-11939	26.5	23.6	5.5	4.24	
1-11939	41.8	14.4	7.6	4.08	
1-11940	37.2	19.7	4.2	2.91	
(b) (5) Cultural Resources Surface					
1-11918	36.3	20.7	4.5	2.62	
1-11918	23.2	14.4	3.8	1.78	
1-11918	32.3	26.7	6.4	5.26	

The Heizer collection stored at the Museum of Anthropology contains a total of [REDACTED] from two separate caves (Table 1). The assemblage includes [REDACTED]

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

[REDACTED] This cursory analysis suggests that prehistoric use of the caves is associated with Middle and Late Holocene occupations. Obsidian hydration studies, along with radiocarbon analysis of the [REDACTED] will provide further evidence for the dating of human occupations at the site.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

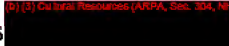
[REDACTED] Since we do not know what mesh size Heizer used in his screens, we cannot assume that this assemblage is representative of the [REDACTED] actually present in the caves, and thus no behavioral interpretations are attempted.

In sum, the [REDACTED] represented in this relatively small sample suggests that multiple activities occurred at Redmond Caves during the Middle and Late Holocene. Further testing in the caves is necessary to more accurately assess the [REDACTED] deposits in the individual caves, or to formulate meaningful interpretations regarding their history and use. It is also recommended that further research involve the tracking of Heizer's field notes or other references to the caves in historic documents. Radiocarbon analysis on the [REDACTED] obsidian hydration and trace element sourcing on obsidian [REDACTED] and paleoethnobotanical analysis on the groundstone are all anticipated avenues of study that will enhance our understanding of ancient human occupations at Redmond Caves.

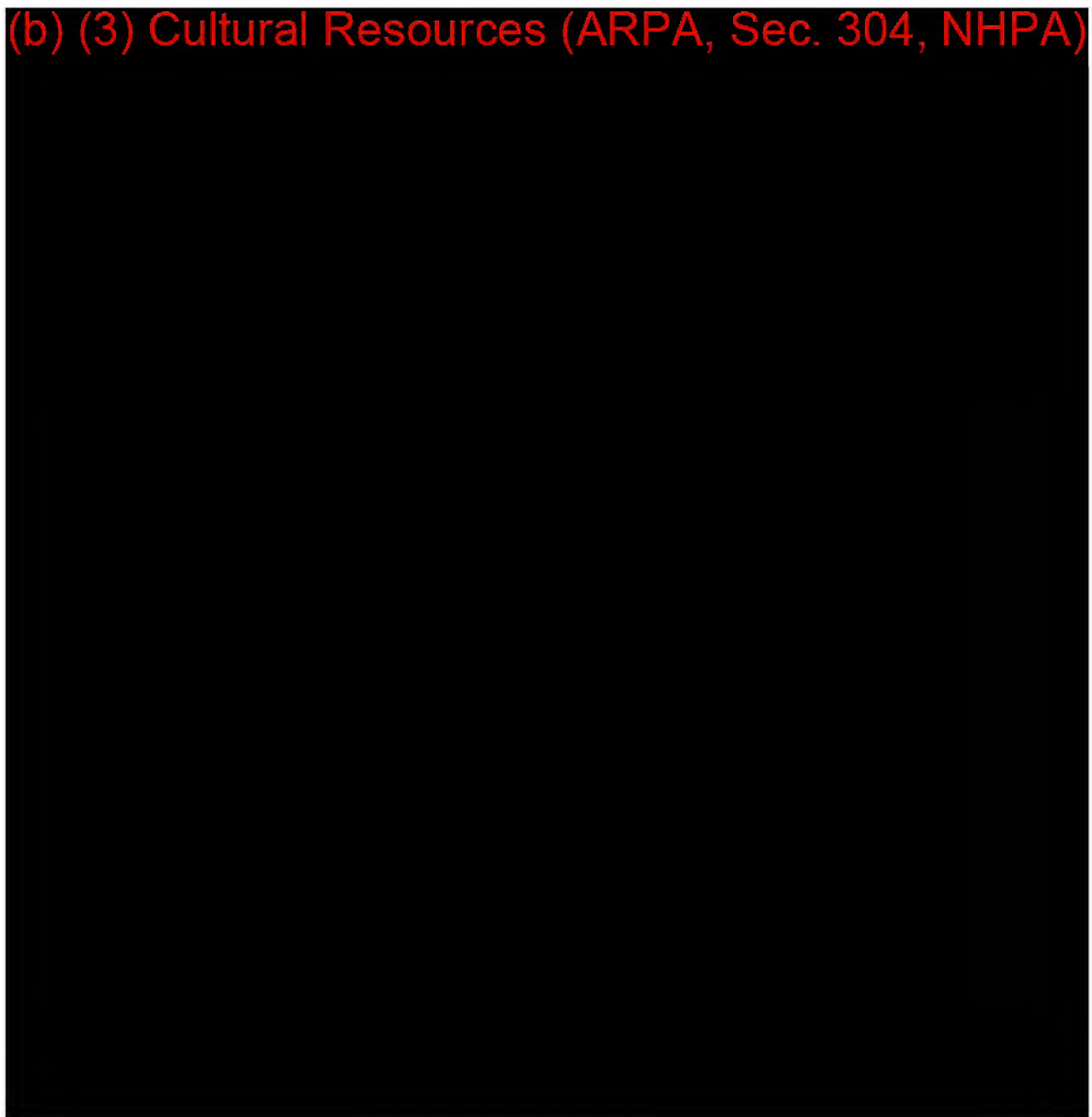


(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure 6. Redmond Caves  recovered by Robert Heizer in 1941.  
Top row: 1-11932, 1-11922, 1-11918, 1-11932; middle: 1-11937, 1-11932,  
1-22922, 1-11932; bottom: 1-11932, 1-11918, 1-11932, 1-11939.

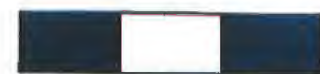
(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



0 3cm

Figure 7. Redmond Caves (b) (3) Cultural Resources recovered by Robert Heizer in 1941.  
Top row: 1-11939, 1-11932, 1-11935, 1-11925; middle: 1-11939,  
1-11939, 1-11918, 1-11939; bottom: 1-11938, 1-11938,  
1-11924, 1-11923.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



0

3cm

Figure 8. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) specimen number 1-11936.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure 9. Top: (b) (3) Cultural Resources (1-11930); bottom: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (1-11931).

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

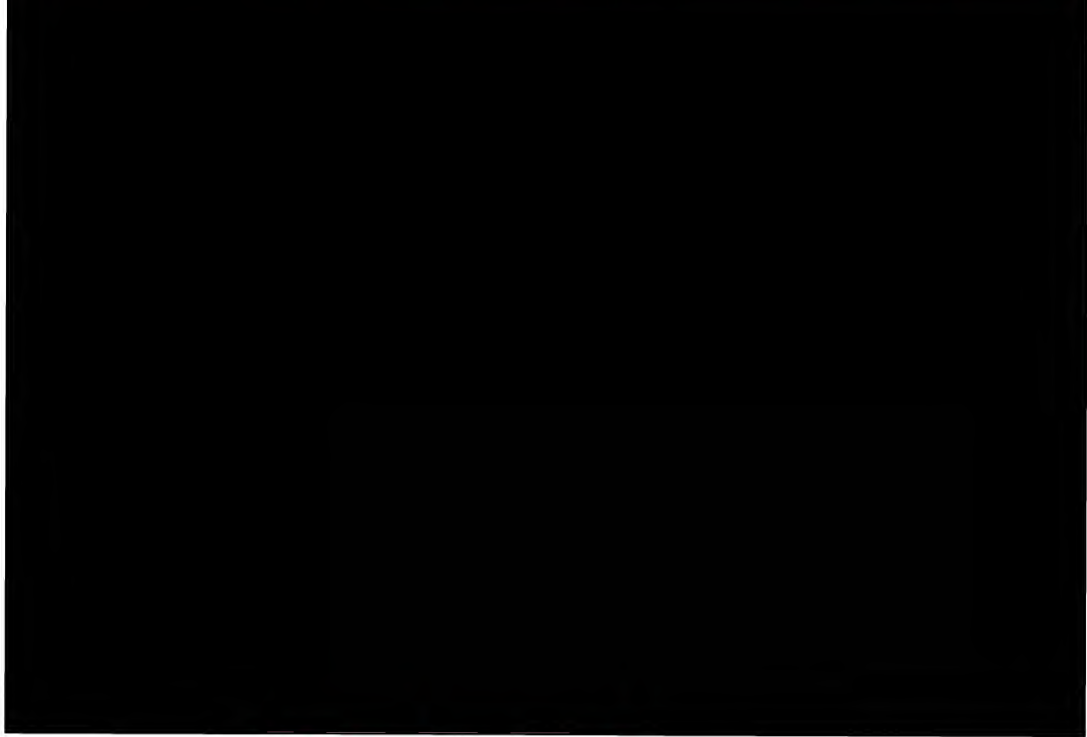


Figure 10. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) 1-11925, 1-11940) and (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) 1-11933).

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



0 3cm

Figure 11. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) specimen number 1-11929.

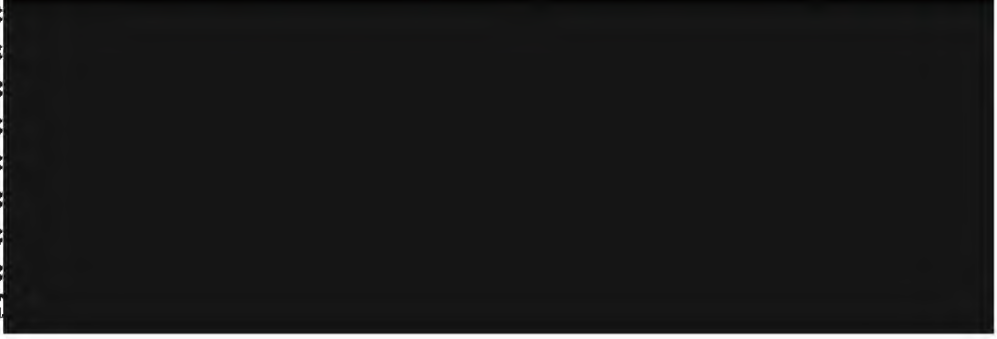
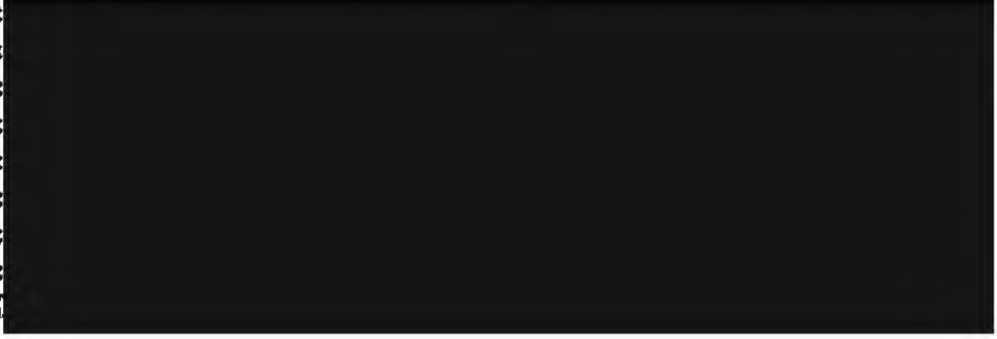
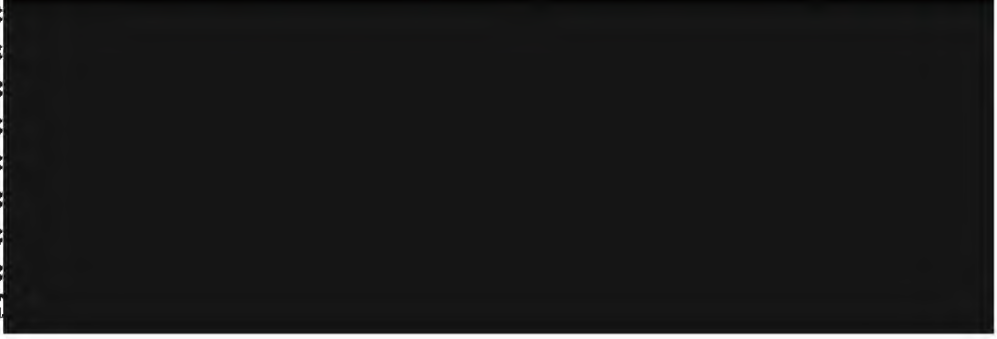
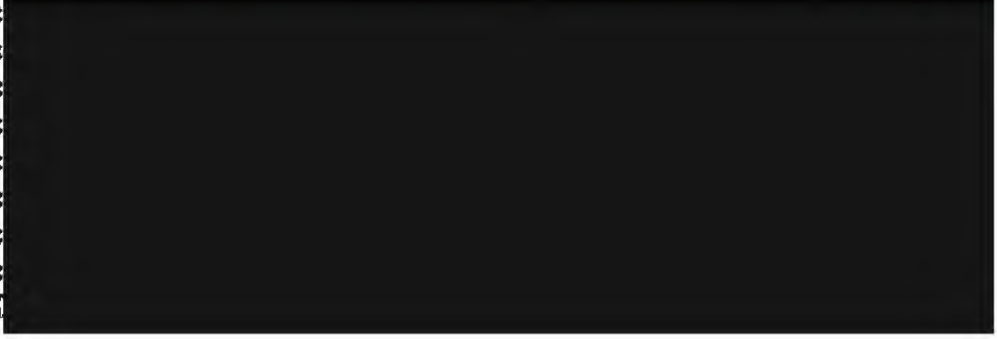
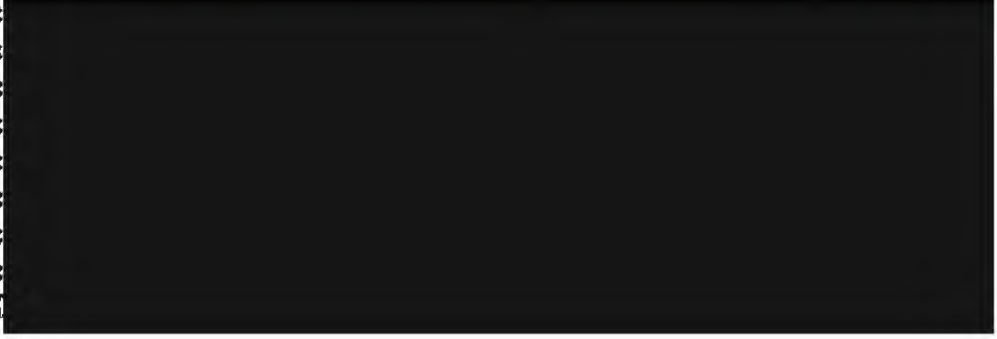
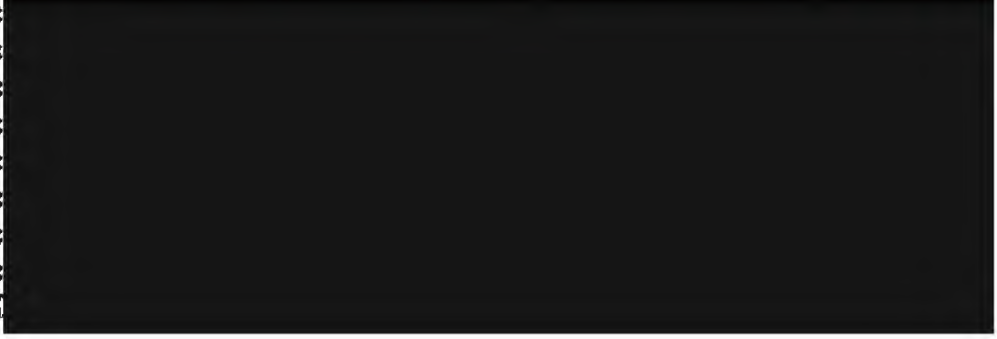
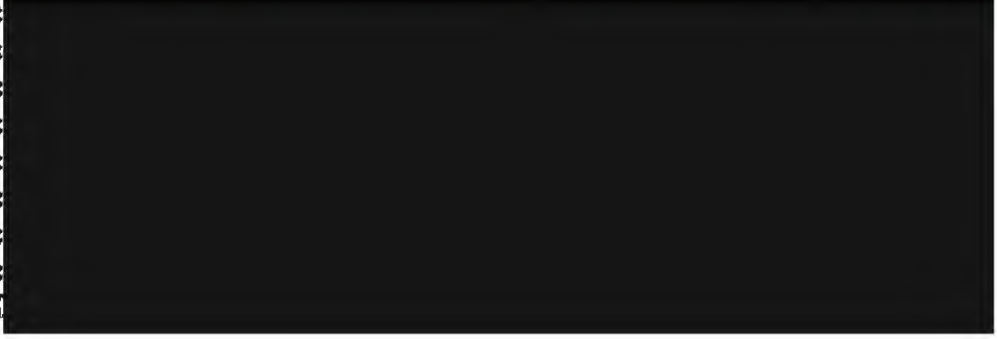
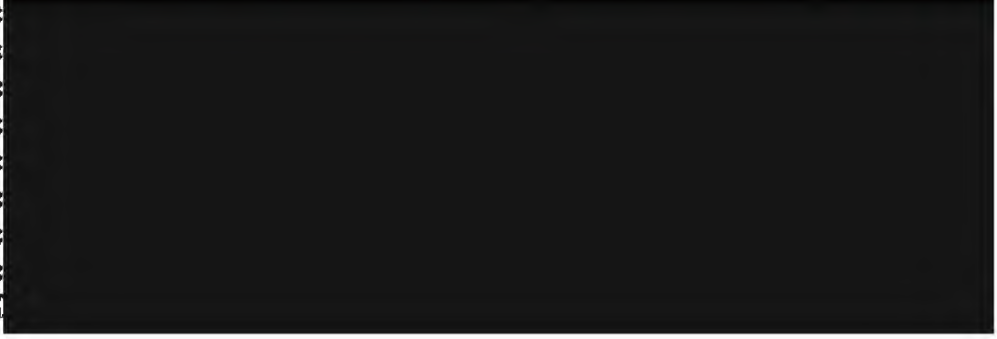
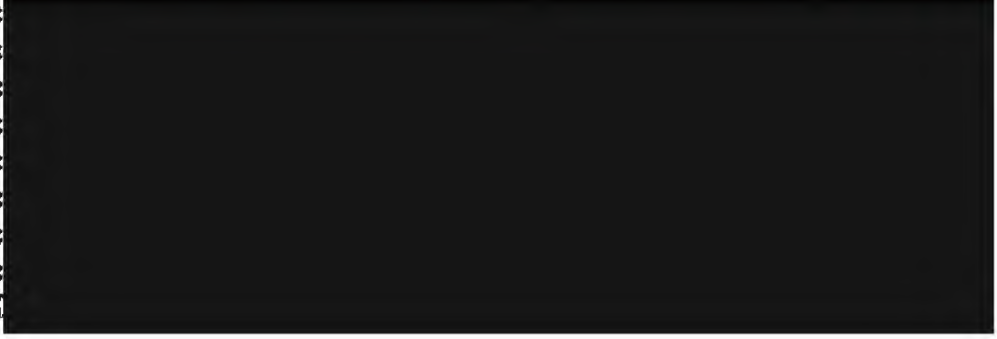
## Archaeological work conducted by John Fagan (1998)

In order to determine the (b) (3) Cultural Resources component for the Redmond Caves master plan, the city of Redmond and the Bureau of Land Management contracted the firm of Archaeological Investigations Northwest (AINW) to perform a reconnaissance-level survey of the (b) (3) Cultural Resources parcel surrounding the Redmond caves. Prior to undertaking the physical survey, AINW researched local newspaper articles, the city of Redmond, local (b) (3) Cultural Resources collectors and the Oregon State Museum of Anthropology in order to ascertain any information on the history of the caves. These inquiries resulted in accounts of unauthorized excavations that reportedly have unearthed substantial assemblages of prehistoric cultural material. Additional accounts told of (b) (3) Cultural Resources collected when the city of Redmond uncovered an unknown cave entrance.

A pedestrian survey was undertaken on May 23 & 24, 1998, by John Fagan and Jo Reese of AINW. The surveyors walked the property spaced 10 to 15 meters apart along the perimeter of the study area. They also examined exposures along the dirt roadways that radiate out from the center of the property and areas adjacent to the various cave mouths. Fagan reported that there had been recent light rain and surface conditions were excellent for discovery of archaeological remains. As a result of this survey, several (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) sites were identified and specific management directives were proposed. (b) (3) Cultural Resources materials were identified but not collected.

Due to the limited nature of this cursory survey about half of the study area was covered, and (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were noted and mapped (Figure 12). Fagan characterized the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) as primarily associated with late to middle phase reduction and pressure flaking. Fragments of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (Fagan 1998). Fagan also made note of the presence of historic and contemporary industrial waste dumps (sawmill debris) on the parcel. Of major concern were the vandalism and the accumulation of incidental trash in and around the caves.

The following list represents a description of the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) resources identified by Fagan, with associated numbers that appear on the map (Figure 12). A comparison of these localities with those identified by the UO Archaeology Field Studies class during Fall 2002 is presented in the following chapter.

#98/423-1: (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
#98/423-2:   
#98/423-3:   
#98/423-4:   
#98/423-5:   
#98/423-6:   
#98/423-7:   
#98/423-8:   
#98/423-9:   
#98/423-10: 



(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

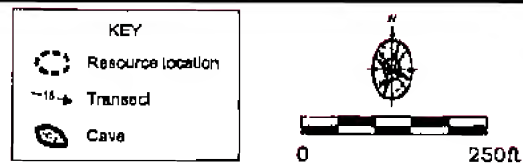
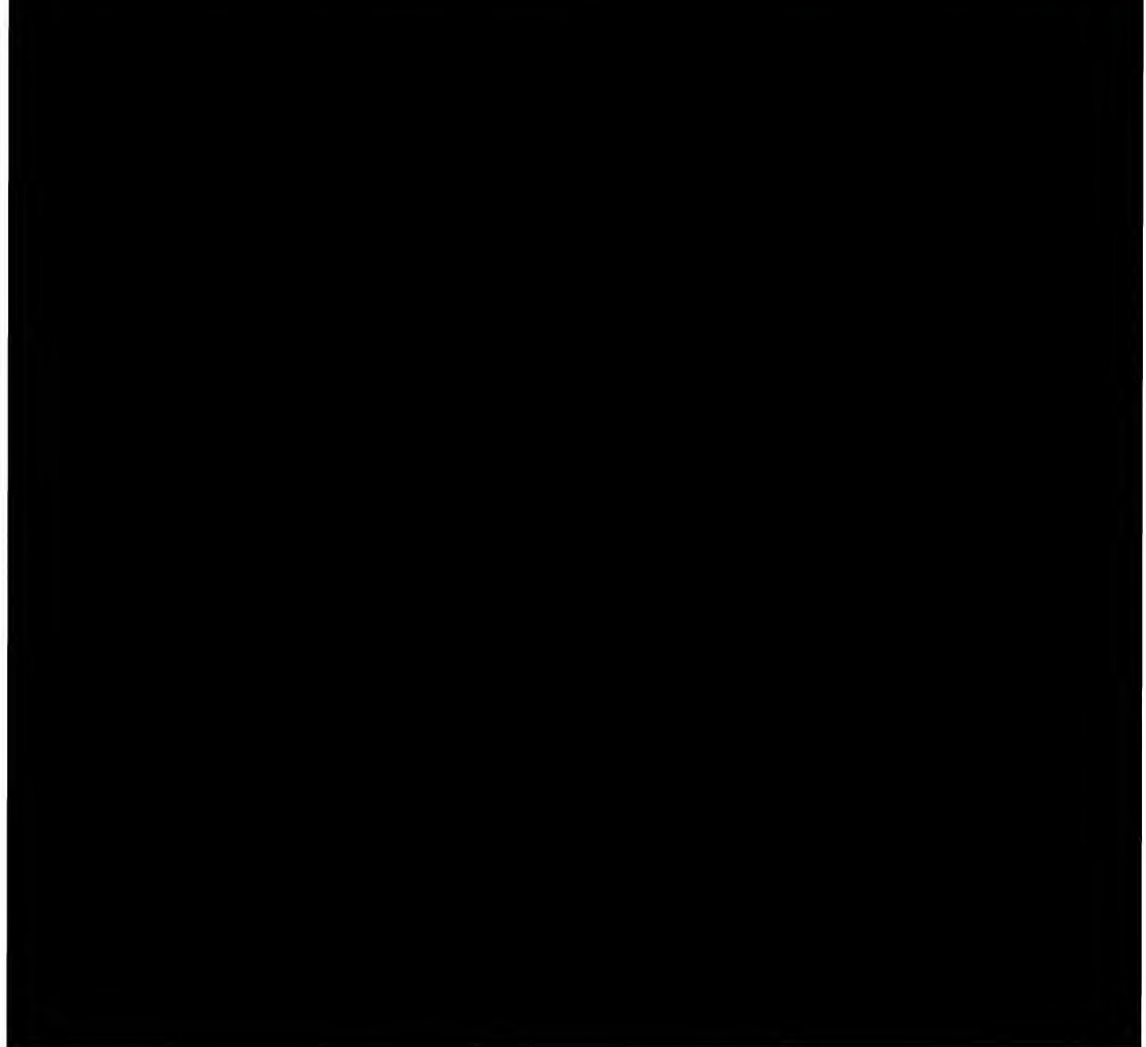


Figure 12. Redmond Caves parcel with archaeological resources identified by AINW noted (Fagan 1998).

The reconnaissance survey conducted by AINW resulted in the identification of serious data gaps in regard to the [REDACTED] resources present at the Redmond Caves parcel. In order to address these gaps, Fagan (1998) recommended that further research should include: 1) a complete systematic survey of the parcel so that all sites and isolates are recorded; 2) consultation with knowledgeable elders and the members of the Culture and Heritage Committee of the Confederated Tribes of Warm Springs to assess the Native American Traditional values contained on site; 3) assessment of the integrity of the remaining deposits within the various caves; 4) evaluation for National Register of Historic Places eligibility; and 5) dating and assessment of site function associated with past uses of the caves.

Drawing on results from the work conducted by AINW, further recommendations were made in the Redmond Caves Master Plan for managing the parcel. These recommendations are geared toward preservation and interpretation of the onsite [REDACTED] resources.

- 1) The Confederated Tribes of the Warm Springs should be invited to add to the information regarding Native American use of the caves and this information should be incorporated into interpretive signs and exhibits for public education.
- 2) Modern litter and industrial debris should be removed after a complete survey has been preformed.
- 3) Install a parking lot, trail system, restrooms, and trash receptacles.
- 4) Eliminate access to motorized vehicles.
- 5) Increase public visibility in order to facilitate better site monitoring and encourage return of artifacts collected from the caves to be used for public education and research.

## CHAPTER 5: REDMOND CAVES SURVEY RESULTS

An archaeological survey of the (b) (3) Cultural Resources parcel near Redmond Caves resulted in the identification of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). Several well used dirt roads, dump sites, camp sites, paintball forts, and previously recorded caves were also located during the survey. The survey was conducted by the UO archaeology field studies class on the Saturdays of September 28th, October 5th, October 12th, and October 19th, 2002. Transects were spaced five meters apart and followed a north-south line. Due to the exposed nature of the landscape and the frequency with which the parcel is visited by the public (including, presumably, (b) (3) Cultural Resources collectors), the decision was made to collect all the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) discovered on the survey. Five (b) (3) Cultural Resources were collected on survey. Coordinates were recorded for all sites and isolated finds. Sites were recorded and mapped using GPS and laser transit (Figures 13 and 14).

The surveys were conducted between 9am and 4pm with more shadows being cast in the mornings. Weather and soil conditions varied from dry and dusty to packed and freshly rained upon. Evidence of recent human activity in the area was noted, such as camp sites, paint-ball blinds, large earth-moving trucks, and the occasional hiker. The following paragraphs will give a more detailed explanation of sites, isolates, and other significant finds from the survey.



Figure 13. Students recording a site on survey.

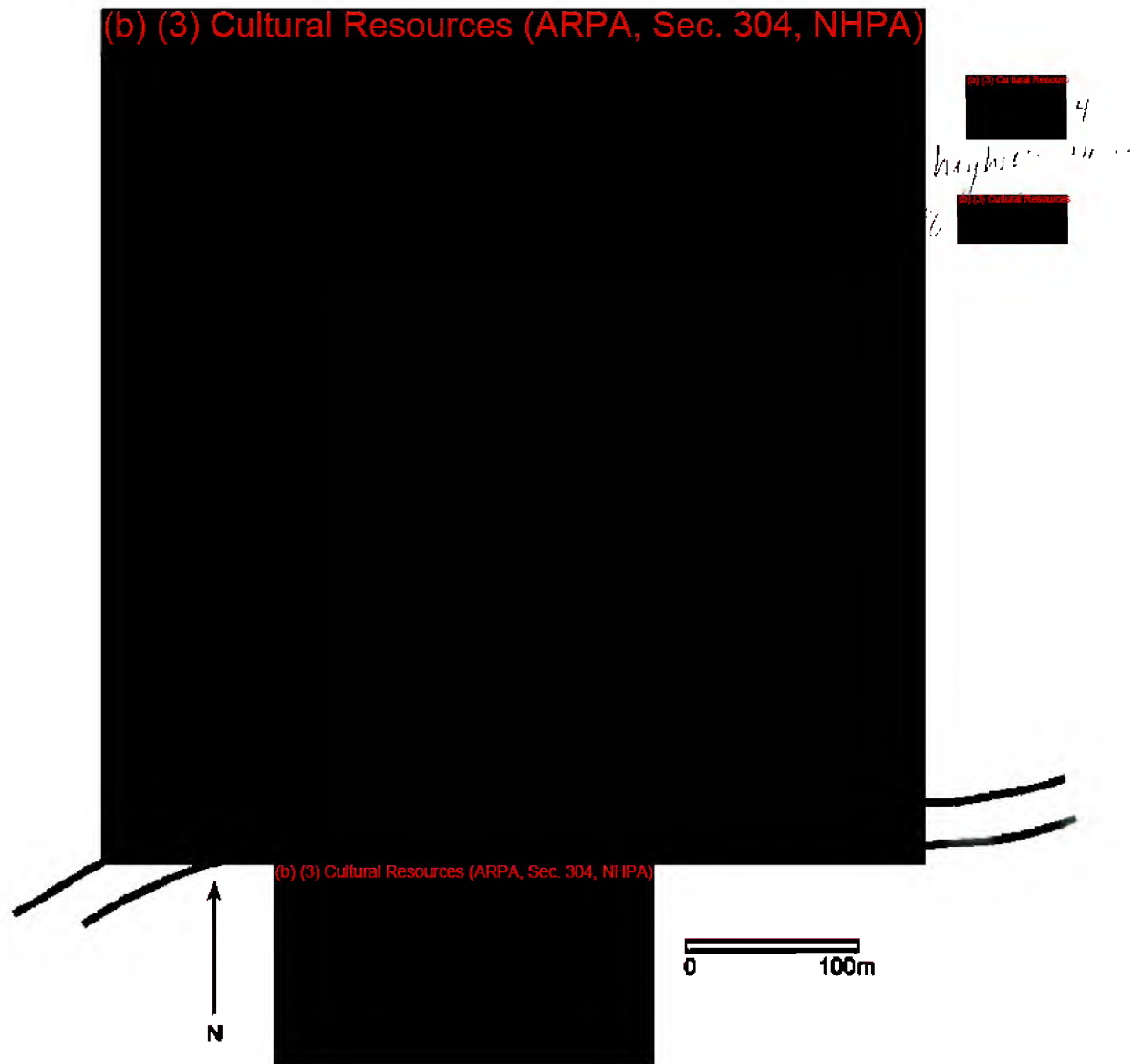


Figure 14. Redmond Caves parcel, showing identified sites and isolates.

## Identified Sites and Isolates

Site (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) is located about 35 meters south of Cave 2 and 60 meters southwest of Cave 1 (Figure 14). The site measures about 575 square meters and contained a (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

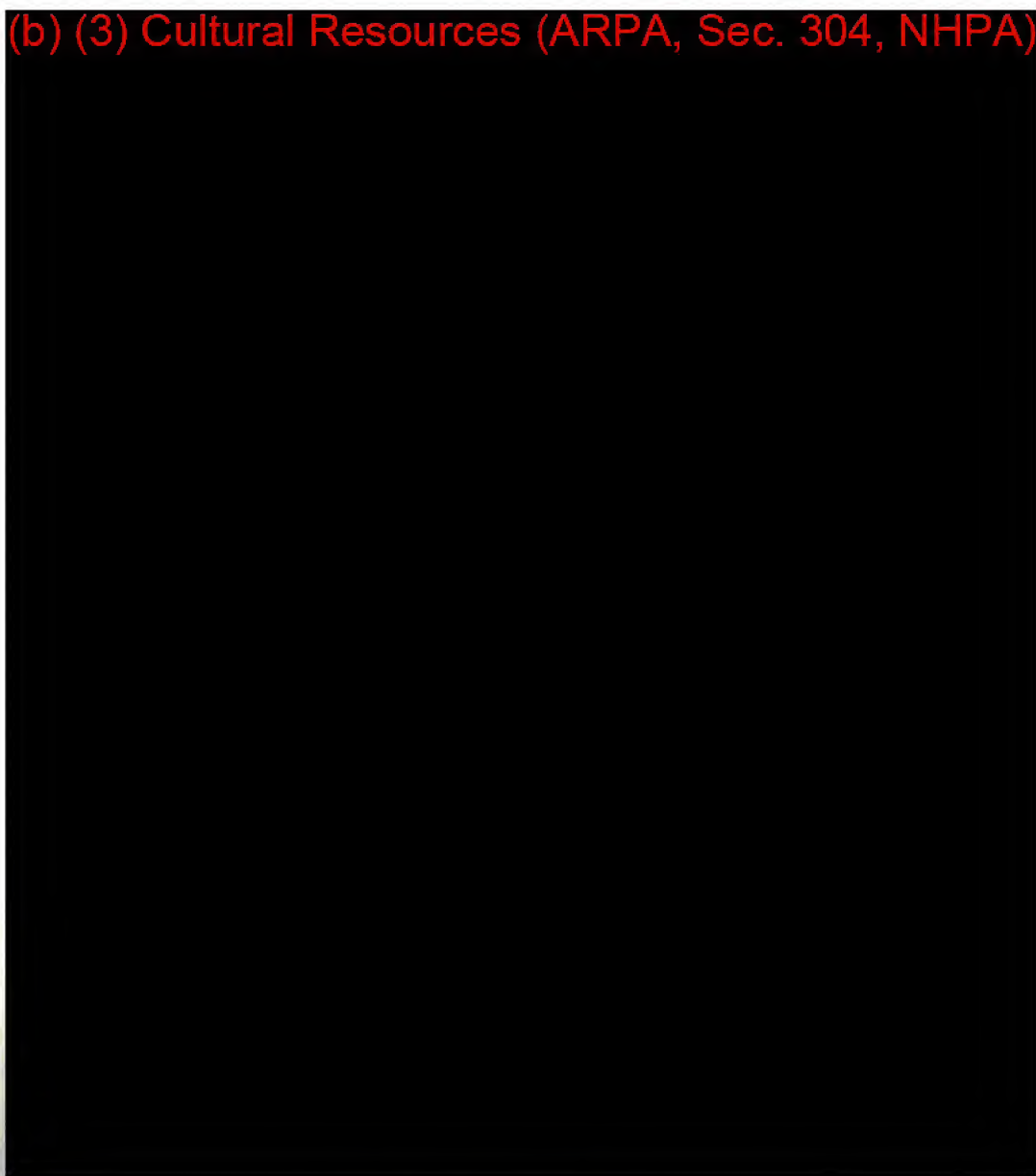
(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

There was obvious evidence of overturned rocks in the 575 square meter site, possibly due to (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) hunters.

The sites and isolates recorded by AINW in 1998 were compared with the sites and isolates recorded by the UO Field Studies class in 2002. Five possible correlations were identified, as listed below (see Figures 12 and 14).

- 1) AINW #98/423-3 may correlate with UO class (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
- 2) AINW #98/423-4 may correlate with UO class (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
- 3) AINW #98/423-5 is site (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
- 4) AINW #98/423-7 may correlate with UO class (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
- 5) AINW #98/423-8 may fall within the boundaries of site (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



0

3 cm

Figure 15. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) recovered during survey of Redmond Caves Parcel.  
Top: 1495- (b) (3) Cultural Resources S-1, 1495- (b) (3) Cultural Resources S-5, 1495- (b) (3) Cultural Resources S-1, 1495- (b) (3) Cultural Resources S-3; middle:  
1495- (b) (3) Cultural Resources S-4, 1495- (b) (3) Cultural Resources S-3, 1495- (b) (3) Cultural Resources S-1; bottom: 1495- (b) (3) Cultural Resources S-2).



(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Site (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Site (b) (3) is located in the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) section of the Redmond Caves BLM land. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) A rock outcropping and large juniper tree is close to the boundaries of this site.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Site (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

The 90 square meter site (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) showed an east – west linear pattern of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) rocks in the area appeared to be overturned and moved, hinting at the possibility of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) collectors. Early interpretation of the site function points toward (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Site (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Site (b) (3) encompassed 228 square meters. This site is located near a dirt road running east from (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (Figure 16). There were many overturned and moved rocks in the area allowing for the of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) collectors. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



Figure 16. Mapping site (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) pin flags marking flakes.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
Site (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Site (b) (3) consists of 612 square meters with a possible site extension about twenty meters east of the center where four (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were found. Over (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) some rocks were overturned and there was recent trash dumped on this site.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
Site (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

RC- (b) (3) measured 220 square meters. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) Overturned rocks were present at this site, suggesting possible site destruction by (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) collectors.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
Site (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were mapped at (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). A scattering of .22 caliber gun shells were also noted in this location. The (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) was collected. The site is located about 20 meters northwest of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). It contained low growing plants, rocks, juniper trees, and sagebrush. Site (b) (3) encompasses an area of about 30 square meters. Overturned rocks were noted.

8 ob flakes

Isolate #1 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
Isolate #1 is an (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) that measures 10mm x 8mm x 2mm and weighs 15 grams.

Isolate #2 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
Isolate #2 is a (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) collected for hydration and sourcing studies. It weighs 29.34g and measures 59.5mm x 43.0mm x 14.8mm.

Isolate #3 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
Isolate #3 is an (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) common to the Middle Holocene in the Northern Great Basin. Weighing 19.8 grams, the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) measures 30mm x 18mm x 5mm with (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Isolate #4 (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)  
Isolate #4 is an (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) The (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) weighs 16.5g and measures 25.5mm x 17mm x 4.5mm.

**Isolate #5**

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Isolate #5 is an (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) weighing 48 grams. It measures 22mm x 13mm x 2.5mm.

**Isolate #6**

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Isolate #6 is an (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) it was not collected.

**Isolate #7**

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Isolate #7 consists of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) which were not collected.



### Disturbances Identified

In addition to [REDACTED] archaeological resources, recent and possible [REDACTED] garbage dumps were encountered during the survey. The following list includes the main garbage dumps identified, with coordinate locations listed. Further study of the [REDACTED] is recommended to ascertain approximate date associated with it.

(N 4900992 E 645306) Garbage area with boards, broken glass bottles, and a burned juniper tree (Figures 17 and 18).

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) [REDACTED] Figure 19).

(N 4901131 E 645410) Stacked rock walls with garbage (Figure 20).

(N 4901115 E 645412) Dump of plastic and metal (Figure 21).

(N 4901126 E 645375) Large industrial dump (Figures 22 and 23).



Figure 17. Garbage and debris near burned juniper tree.



Figure 18. Glass and wood dump near burned juniper tree.

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

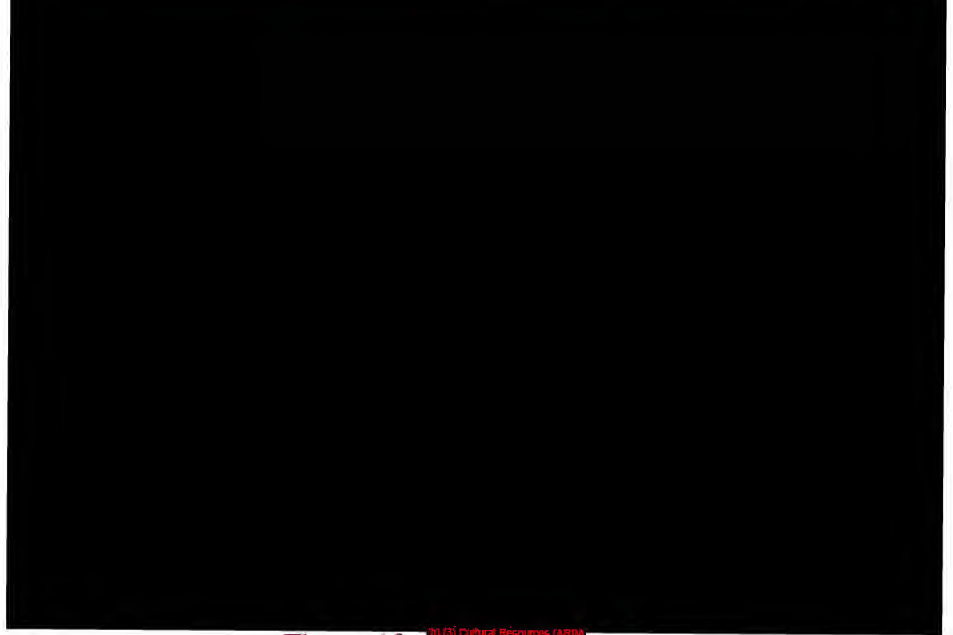


Figure 19. (b) (3) Cultural Resources (ARPA)





Figure 20. Stacked rock wall (background) and industrial debris.



Figure 21. Wood and plastic debris.





Figure 22. Large industrial dump.



Figure 23. Large industrial dump.

Evidence of homeless encampments and destruction by graffiti both inside and outside of the caves was also noted (Figures 24-29). An on-going record of these disturbances will be incorporated into the Redmond Caves Archaeological Project.



Figure 24. Tree house.



Figure 25. Modern camp on edge of proposed parking lot, probe 6.





Figure 26. Evidence of recent camping in entrance of [REDACTED]



Figure 27. Graffiti on entrance of [REDACTED]



Figure 28. Graffiti on rock wall outside of

(b) (5) Cultural Resources



Figure 29. Graffiti and evidence of digging inside

(b) (5) Cultural Resources

## CHAPTER 6: EXCAVATION RESULTS

Twenty-six probes were excavated on the Redmond Caves parcel during the fall term, 2002. Twenty probes were excavated in the area of the proposed parking lot and visitor's center. Six probes were excavated in site (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). All probes measure 50x50 cm and were dug in 10 cm levels.

### Proposed Parking Lot Probes

The proposed parking lot is located along 14<sup>th</sup> street and approximately 70 meters north (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (Figure 3). During the initial survey of the area, no (b) (3) Cultural Resources material was found on the surface. However, subsurface testing was done at this location to ensure that no buried (b) (3) Cultural Resources deposits would be impacted by the construction of a parking lot and visitors' center. Probes were spaced 25 meters apart in a grid-like pattern across the proposed parking lot (Figure 30). The probes were excavated in 10 cm levels to the average depth of 50 cm (Table 3). No (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were identified in the probes at this location.

Table 3. Probes in area of proposed parking lot and visitor's center.

Probe #	Easting	Northing	Depth(cm)	Reason for termination
1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)		68	sterile
2			60	rock
3			50	sterile
4			50	rock
5			60	sterile
6			20	rock
7			30	rock
8			50	sterile
9			30	rock
10			50	sterile
11			50	sterile
12			45	root
13			30	rock
14			45	rock
15			5	rock
16			30	rock
17			50	sterile
18			35	rock
19			50	sterile
20			25	rock

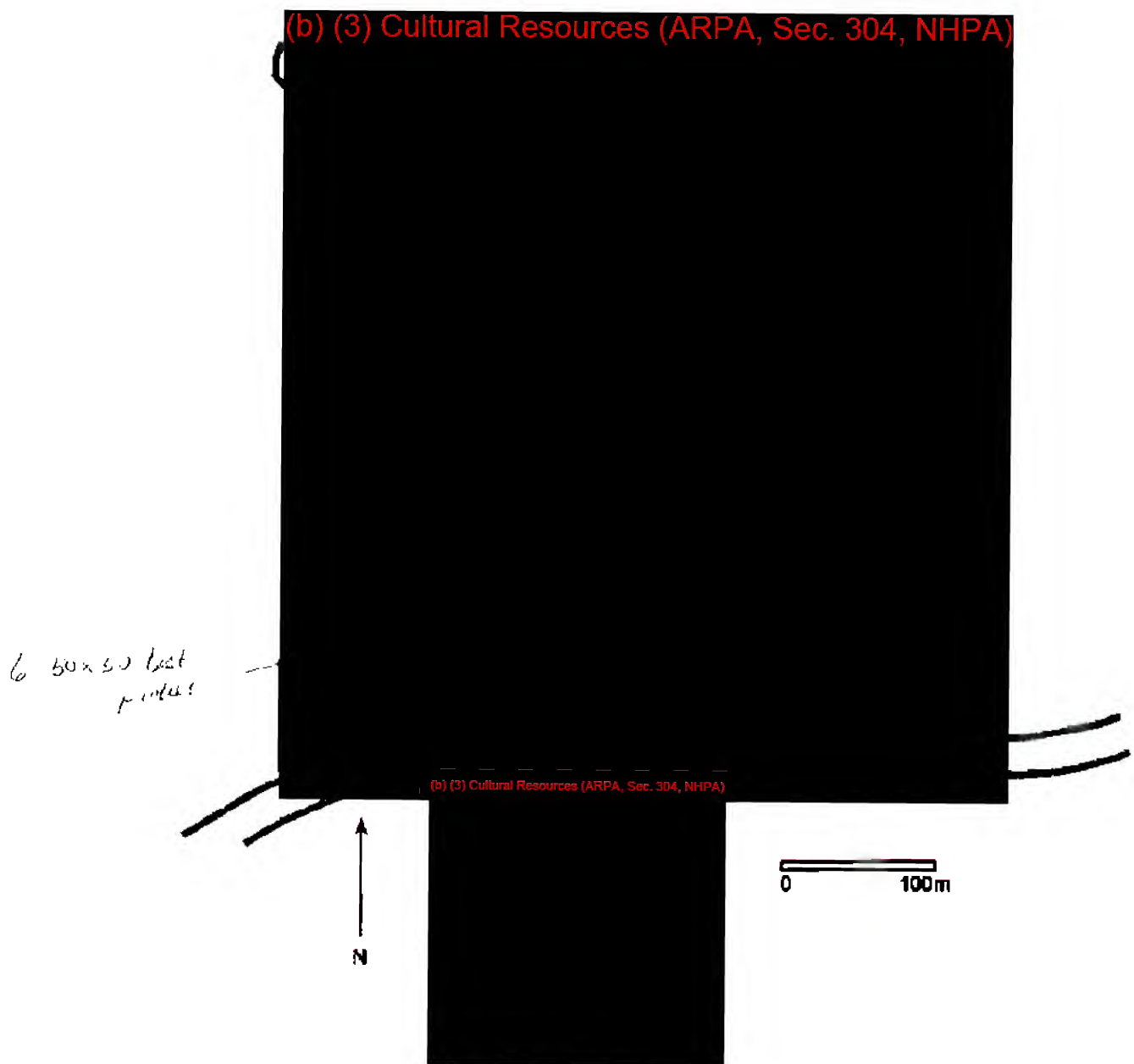


Figure 30. Location of probes in area of proposed parking lot and visitor's center. Caves, sites, and isolates also noted.



Site

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

**(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)** The site is located approximately 120 meters southwest of (b) (3) Cultural Resource (Figure 30). Based on the material observed on the surface, the site measure about 220 square meters, or 16 x 20 meters. The site is bordered to the north by a dirt access road, and transected by similar roads near the eastern and southern boundaries (Figure 31).

The dominant vegetation at the site consists of scattered juniper trees, sagebrush, and low growing grasses. Several mature juniper trees are located just outside the eastern and southern boundaries of the site.



Figure 31. Sketch map of (b) (3) Cultural Resource with location of probes.

The site was discovered during the survey of the (b) (3) Cultural Resources parcel near Redmond Caves. Initial investigations at the site produced a (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (Figure 15). In addition (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) Given the exposed nature of the site and its close proximity to the access roads, the (b) (3) Cultural Resources were collected during survey. Signs of disturbance within the site include overturned rocks and clusters of obsidian (b) (3) Cultural Resources which appeared to have been recently gathered and placed adjacent to small shrubs.

(b) (3) Cultural Resources was chosen for subsurface excavation by the University of Oregon Field Studies class, fall term 2002. At the request of the BLM Prineville District, the excavations at (b) (3) Cultural Resources were limited to six 50x50cm probes. Probes 1 through 3 and 5 were placed along a transect 45 degrees west of north. Probe 4 was located to the west of the 45 degree transect and probe 6 was located to the east of the 45 degree transect. Probes 1, 2, and 3 were spaced ten meters apart along the 45 degree transect. A prominent rock shelf made it impossible to locate probe 5 ten meters from probe 3, so the decision was made to place this probe just five meters from probe 3.

All probes were excavated in 10 cm levels and sediment was passed through 1/8-inch screens (Figures 32 and 33). All (b) (3) Cultural Resources material was collected, bagged, and labeled for laboratory analysis. The excavated depth of the probes ranged from 10 cm to 50 cm; each was terminated when a rock bottom was encountered.

## Excavation Results

In addition to the (b) (3) Cultural Resources found in the site during the initial survey, subsurface excavations produced (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). A summary of the (b) (3) Cultural Resources material uncovered in the probes is presented in Table 4. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Probe 1 produced (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) in level 1. The probe was terminated at a depth of 30 cm because of a basalt rock bottom. In addition to the (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) recovered within the probe.

Probe 2 was terminated at a depth of 30 cm because of a rock bottom. There were (b) (3) Cultural Resources found within the probe. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were recovered in the first level. (b) (3) Cultural Resources were found in level 2, and (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) was recovered in level 3. The probe was terminated due to a rock floor.





Figure 32. Excavation underway at



Figure 33. Excavation in proposed parking lot area.

Probe 3 produced the highest concentration of (b) (3) Cultural Resources as well as (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA). There were (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) was also recovered in level 5. (b) (3) Cultural Resources may indicate the presence of a (b) (3) Cultural Resource feature, such as (b) (3) Cultural Resources. While no discernible feature was identified, further excavation at this location is advised.

Probe 4 generated a total of (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) came from the top level. The probe was terminated at a depth of 30 cm due to the basalt rock floor.

Probe 5 was excavated to a depth of 30 cm. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) were recovered in level 1, and (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) came from level 2. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) was found in the top level. The basalt rock was encountered at 25-30 cm.

Probe 6 produced (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) in the top 10 cm of deposit. Rock was encountered at 30 cm and the probe was terminated.

Table 4. Site (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) probes by level.

Probe #	Level	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
P1	1	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
	2	
	3	
	4	
P2	1	
	2	
	3	
P3	1	
	2	
	3	
	4	
	5	
P4	1	
	2	
	3	
P5	1	
	2	
	3	
P6	1	
	2	
	3	



The distribution of (b) (5) Cultural Resources (ARPA, Sec. 304, NPS) by level recovered from the probes at (b) (5) Cultural Resources is presented in Figure 34. The relatively shallow deposits at the site are reflected in the graph. The excavated probes indicate that the (b) (5) Cultural Resources deposits are close to the surface, with 39% of materials found in the top 10 centimeters and 69% of materials recovered in the top 20 centimeters. Probe 3 shows a slightly different distribution. The predominant amount (74%) of (b) (5) Cultural Resources material from this probe comes from a depth of 20 to 30 cm below the surface (Figure 35).

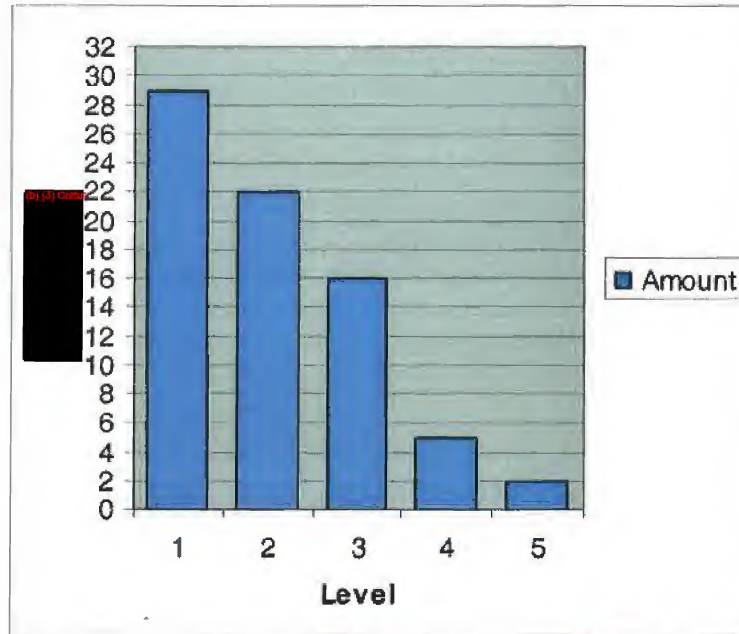


Figure 34. Amount of (b) (5) Cultural Resources per level in (b) (5) Cultural Resources probes.

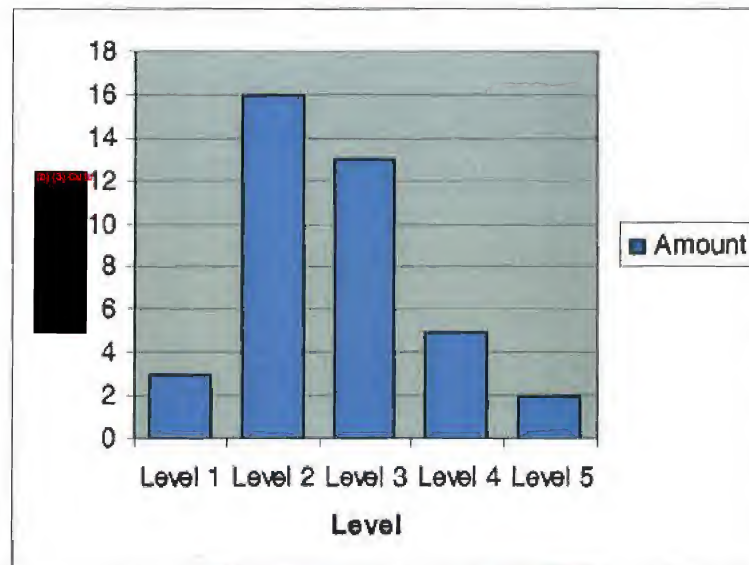


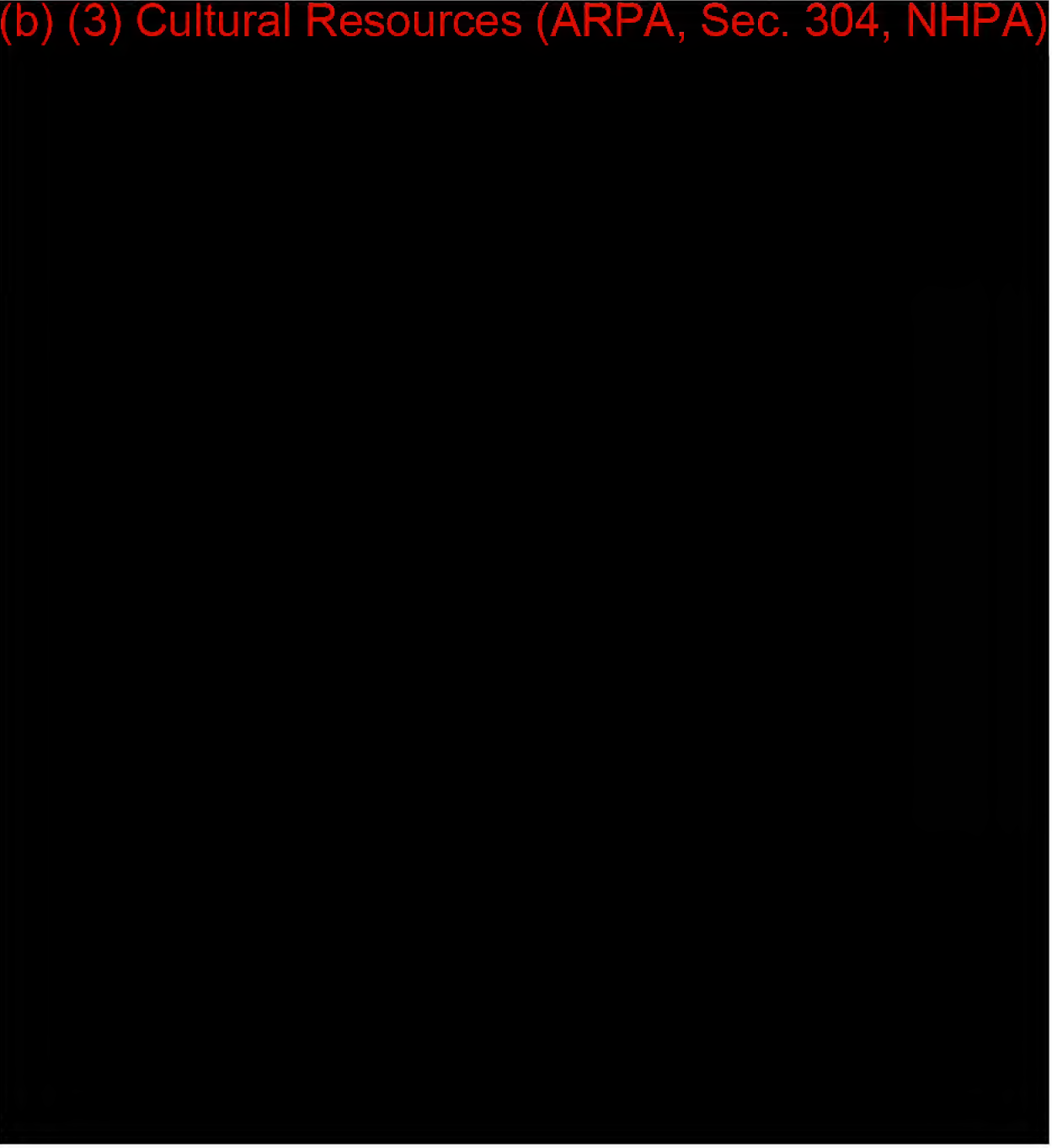
Figure 35. (b) (5) Cultural Resources by level for (b) (5) Cultural Resources Probe 3.

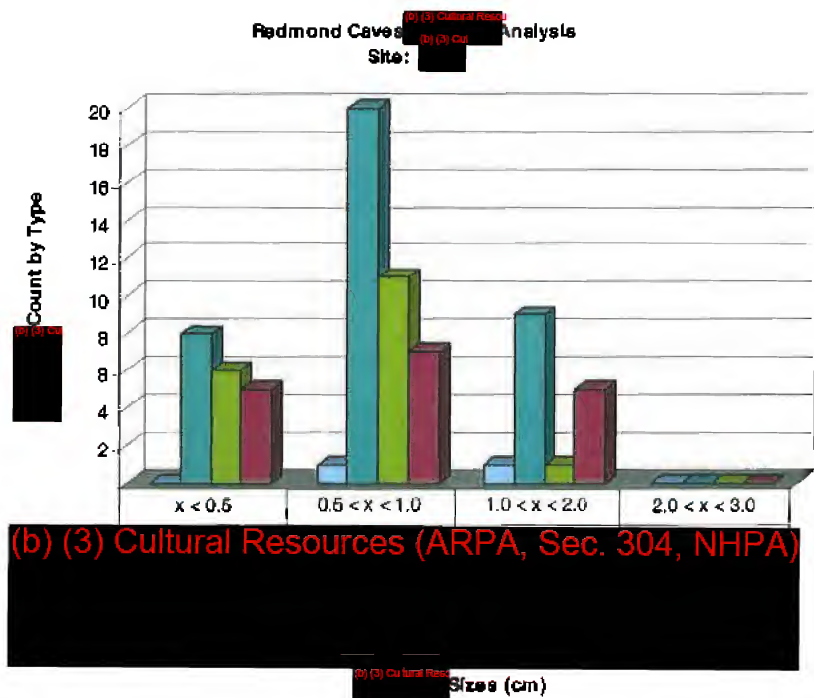


(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

## Analysis

(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)





Count by Type/Size (cm)	
Size (cm)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
$x < 0.5$	
$0.5 < x < 1.0$	
$1.0 < x < 2.0$	
$2.0 < x < 3.0$	
Total	

Percentage by Type/Size (cm)	
Size (cm)	(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)
$x < 0.5$	
$0.5 < x < 1.0$	
$1.0 < x < 2.0$	
$2.0 < x < 3.0$	
Total	

Figure 36. Analysis of (b) (3) Cultural Resources by type and size from (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

## Summary

A total of 26 probes was excavated on the [REDACTED] parcel associated with Redmond Caves. Twenty probes were excavated in the area of the proposed parking lot and visitor's center. Six probes were excavated in the site [REDACTED]. No [REDACTED] deposits were encountered in the parking lot area, making this a good location for development.

### (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Both radiocarbon analysis on the [REDACTED] obsidian hydration from [REDACTED] collected from this site will provide a more accurate assessment of the time the site was occupied.

The limited number of probes excavated in [REDACTED] made it difficult to determine site boundaries from sub-surface investigations. The results, however, do provide information about depth of deposits and possible site function. The deposits are shallow at [REDACTED] with the highest concentration of [REDACTED] material recovered in the top 20 cm of sediment. Probe 3 indicates a slightly deeper deposit, [REDACTED]. This may indicate that an [REDACTED] is present. Further testing is necessary to determine the significance of the subsurface deposits at this site. Further testing is also recommended with respect to the [REDACTED] analysis. While [REDACTED] at the site is suggested by the high percentages of [REDACTED] a larger sample from [REDACTED] and sites in the vicinity would lead to a more thorough understanding of the activities that occurred at the site in the past.

## CHAPTER 7: CONCLUSION

This report represents the first stage of a multi-year project in which University of Oregon students, under the guidance of the staff at the Oregon State Museum of Anthropology, engage in archaeological research at Redmond Caves. The work is being conducted for the City of Redmond and the Bureau of Land Management, who are engaged in a collaborative effort to develop the [REDACTED] BLM parcel into a city managed park. Students involved in this project are enrolled in the Archaeology Field Studies class (ANTH 408) in Bend. ← ?

Archaeological investigations at the Redmond Caves parcel for Fall Term 2002 included a pedestrian survey (in which sites and isolated finds were identified and mapped), subsurface testing in the proposed parking lot area, subsurface testing in site [REDACTED] and analysis of [REDACTED] recovered from the caves by Robert Heizer in 1941. The survey was conducted by walking north-south transects at 5 meter intervals. A total of [REDACTED] (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) [REDACTED] (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) isolates outside the caves were identified and mapped. The sites were characterized by [REDACTED] (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) [REDACTED] recovered from surface collections are represented by both (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)

Six 50x50 cm probes were excavated in site [REDACTED] to determine the nature and depth of [REDACTED] deposits at this location. The sediment consisted primarily of loose volcanic ash; no significant stratigraphic changes were observed. [REDACTED] deposits were concentrated in the top thirty centimeters and consisted mostly of [REDACTED] Probe 3 produced a [REDACTED] (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA) Analysis of the [REDACTED] recovered from [REDACTED] suggests that later stages of [REDACTED] occurred at the site. Further testing is necessary, however, to determine with more accuracy the activities that took place at this location in the past. Additional probes would also help to determine the actual site boundaries.

Twenty 50x50 cm probes were excavated in the location of the proposed parking lot and visitors' center. No archaeological resources were encountered on the surface during survey, and no [REDACTED] remains were identified in the subsurface testing.

**(b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)**

The archaeological investigations at Redmond Caves will continue in the spring 2003. The focus will be placed on further testing at [REDACTED] and other sites previously identified. Specimens from the current collection will be sent off for analyses, such as obsidian studies and radiocarbon. (b) (3) Cultural Resources (ARPA, Sec. 304, NHPA)



have been selected for obsidian hydration and sourcing. These results will be included in the spring report.



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